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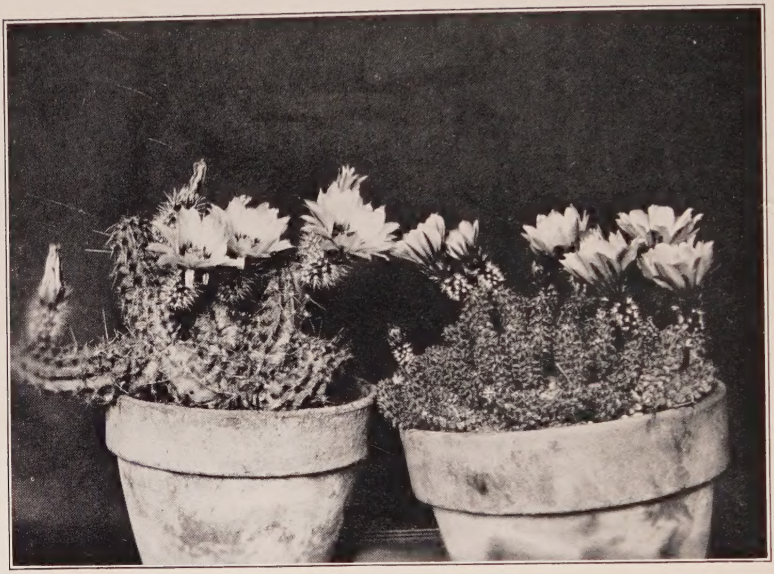

Fig. 1 (upper). Echinocereus papillosus (left); E. angusticeps (right).
Fig. 2 (lower). Echinocereus angusticeps.

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THE NEW ENGLAND BOTANICAL CLUB

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ECHINOCEREUS ANGUSTICEPS, A NEW SPECIES FROM THE LOWER RIO GRANDE VALLEY, TEXAS[1]

Elzada U. Clover

Plate 327

According to Britton and Rose, *Echinocereus papillosus* A. Lke. occurs in western Texas and supposedly also in the vicinity of San Antonio. For several years it has been known in the Lower Rio Grande Valley, Texas. The first collection, which was made by the author, was in 1926, when two specimens were found five miles north of Loma de la Cruz, near Rio Grande City, Starr Co., Texas. Recent collections (*Clover* 15255 and 548) have been made ten miles west of Edinburg, Hidalgo Co., Texas, where the plant is abundant in an area at least a mile square.

This range was extended during the course of mapping Starr County. Many specimens were found near Rucio, a ranch home about fourteen miles north of Rio Grande City, and from here the plants were numerous in the brush along the Hebbronville road southward for ten miles.

The soil here is light sandy loam with some red gravel and limestone on low hills. *Echinocereus papillosus* is found growing under the shelter of shrubs or large opuntias. These low hills are covered with typical chaparral in which *Acacia amentacea*, *Acacia Berlandieri* and *Leucophyllum texanum* predominate. *Prosopis juliflora* (the mesquite), *Condalia obovata* and *Bumelia angustifolia* are found in this association. Other cacti occurring with *Echinocereus papillosus* are *Coryphantha*

[1] Papers from the Department of Botany and Herbarium of the University of Michigan, No. 493.

Runyonii, Lophophora Williamsii, Ancistrocactus Scheeri and *Neomammilaria hemisphaerica.*

Within the last few years a type somewhat resembling *E. papillosus* has been found in a limited area near Linn, seventeen miles north of Edinburg, Hidalgo County. It is called "The small papillosus," by nurserymen in southern Texas. It seems to have been first discovered by Mrs. Troy Downs of Alamo, Texas.

The association in which it grows is quite different from that of the larger form, and the fact that the two never occur together has significance. The soil is light sandy loam to dark loam, and the vegetation consists of scattered mesquites and grass with *Zizyphus obtusifolia, Lippia ligustrina, Karwinskia Humboldtiana, Dolicothele sphaerica, Neomammillaria hemisphaerica, Hamatocactus setispinus* and *Jatropha spathulata.*

Although many of the species of this association are also found in the habitat of *Echinocereus papillosus*, the nature of the associations is not at all alike. The cactus near Linn grows in open places with less protection than the other form gets. It differs greatly in size and habit from its relative, as Plate 327, fig. 1 will show. Specimens under observation in the Michigan Botanical Gardens (nos. 547 and 548) have been given identical conditions for two years and still retain these characteristic differences. Environmental conditions in the field do not therefore appear to be responsible for the difference in habit and form.

Both species blossom during April and May in the greenhouse, probably earlier in the field, the flowers remaining open for two or three days.

According to reports of cactus growers *Echinocereus papillosus* is more difficult to grow than the other species, for the two appear to be specifically distinct. The chief characteristics of the two types compiled from notes on many specimens are shown below in parallel columns:

Characteristics	Echinocereus papillosus	Echinocereus angusticeps
Number of stems in clump	one to nine	five to ninety-five
Diameter of largest clump	thirteen inches (nine stems)	twelve inches (ninety-five stems)
Length of stem	fifteen to seventeen cm.	four to eight cm.
Diameter of stem	five to seven cm.	two to three cm.
Number of ribs	eight to nine	seven to eight
Number of spines on rib	radial, eight to ten; central, one	radial, seven to nine; central, one

Characteristics	Echinocereus papillosus	Echinocereus angusticeps
Flower color	sulfur-yellow segments; center, nopal to brazil red	same
Width of flower	seven to nine cm.	seven to nine cm.
Length of flower	nine to nine and six-tenths cm.	eight and five-tenths to nine cm.
Series of perianth-segments	four	five
Shape of segments	oblong-spatulate, acuminate	oblong-spatulate to ovate
Apex of segment	long-apiculate	short-apiculate to blunt
Serration of segments	finely erose	deeply erose to entire
Color along middle trace of outer perianth-segment	deep hellebore red	purple-drab

The differences justify the recognition of a new species, since there should be a definite name for a plant which is known by all local cactus enthusiasts as being distinct from the one already well known as *Echinocereus papillosus.*

Echinocereus angusticeps sp. nov. (TAB. 327, FIGS. 1, dextra, et 2) caespitosus, caulibus 6–95, decumbentibus vel erectis 4–8 cm. altis, 2–3 cm. crassis; costis 6–8 rectis summitate vix spiralibus, verticaliter sinuatis, modice altis, in tuberculas fere solutis; spinis lateralibus radiatim porrectis 7–9 acicularibus, albis vel luteis, centrali solitaria, succineo-alba; areolis 1–2 mm. latis, rotundis; florentibus rotundis, spinis albis, 4–13, longissimis 6 mm. longis; floribus magnis 8.5–9 cm. longis, 7–9 cm. latis, medio rubro alibi sulfureo-luteis; segmentis perianthii 5-seriatis, exterioribus medio atropurpureis, marginibus et apice luteis, stylo viridi, stigmatis lobis 10–12; filamentis numerosis, antheris luteis, fructibus viridescentibus. Specimen typicum vivum ex loco Texensi "Linn" dicto conservatum est in Horto Botanico Universitatis Michiganensis; siccatum sub numero 15261 in Herb. Univ. Mich., Ann Arbor, Michigan.

Echinocereus angusticeps n. sp. (PLATE 327, FIGS. 1, right, and 2) caespitose, stems procumbent to ascending, several to many, 4–8 cm. long, 2–3 cm. in diameter, ribs 6–8, prominent, definitely tuberculate; radial spines 7–9, white to yellow, porrect, acicular, upper ones in each group smaller, about 4 mm. long; central spine solitary, brown, acicular, erect, 7–8 mm. long; flowers showy, delicately fragrant; perianth-segments in five rows, segments 3–4 cm. long, 1.5–2 cm. wide, sulfur-yellow, nopal to brazil red at center, the outer ones purple-drab on the outside along the middle trace, oblong-spatulate to ovate, short-apiculate to blunt, erose; scales on ovary purple-drab[1] to reddish, spines on ovary 4–13, longest 6 mm. long, white; width of flowers 7–9 cm., length of flower 8.5–9 cm., stamens cream-colored, shorter than the pistil, stigma-lobes 10–12; fruit greenish.

[1] Colors according to "Color Standards and Nomenclature," Ridgeway,

Distribution: known only from open mesquite woods, Linn, Hidalgo County, Texas (type locality).

Department of Botany, University of Michigan.

Explanation of Plate 327

Fig. 1. Echinocereus papillosus A. Lke. (Mich. Bot. Gard. No. 15255, left); Echinocereus angusticeps Clover (Mich. Bot. Gard. No. 15261, right) showing differences in size and habit.

Fig. 2. Echinocereus angusticeps Clover (Mich. Bot. Gard. No. 15261).

NOTES ON THE FLORA OF WORCESTER COUNTY, MASSACHUSETTS

David Potter and Norman P. Woodward

In the list of "The Herbaria of New England" compiled in 1901 by the late Mary A. Day[1] no herbaria are listed from Worcester County. During the years which have elapsed since the above article appeared much active botanical work has been accomplished in and about Worcester, which has resulted in the appearance of at least four small herbaria. The smallest of these is that of the late Joseph Jackson, author of "The Flora of Worcester County."[2] After the death of Mr. Jackson his herbarium became the property of Miss Ethel L. Rider, a teacher in the North High School of Worcester, Massachusetts, and is there housed. The senior author has recently examined this collection and found it to contain 713 named species and varieties, with practically no duplication. In addition there are about 30 sheets of unnamed specimens. These plants, collected between the years 1878 and 1885, are in white paper folders and for the most part unmounted. 517 of the above noted 713 plants were collected in Millbury, Massachusetts. Mr. Jackson states in the preface to his first edition that he at first planned to write only a flora of Millbury, but finally expanded it to include the whole county. This first edition contained 810 species and well marked varieties. The second edition lists 1098, while the third increased the count to 1240. A supplement to this work, by Norman P. Woodward[3] was published in 1927 adding some 421 plants new to the county, thus making the total number of species reported 1661.

[1] Day, Mary A. The Herbaria of New England. Rhodora, 3: 67–71, 206–208, 219–222, 240–244, 255–262, 281–283, 285–288.

[2] Jackson, Joseph. Flora of Worcester County, Massachusetts. Worcester Natural History Society, 1883. 2d edition, 1894, 3d edition, 1909.

[3] Additions to Flora of Worcester County. Edited by Norman P. Woodward. Worcester Natural History Society, 1927.

The Herbarium of the Worcester Natural History Society contains approximately 6280 sheets, of which 4307 are from Worcester County. This count includes only the Pteridophyta and the Spermatophyta, although the Society has a very creditable collection of both the Bryophyta and certain of the Thallophyta. Unfortunately, the herbarium is poorly housed from a standpoint of accessibility, with very limited space for work, and kept in an unheated room.

The Biology Department of Clark University has an herbarium of approximately 10,000 sheets. This collection is not restricted to the flora of Worcester County but is primarily a teaching collection. In addition to the New England material it contains 280 sheets from the Galapagos Islands, collected by Dr. Bauer in 1891, Dr. Potter's collection[1] of about 600 numbers from the region of James Bay (the southern portion of Hudson Bay) and about 700 sheets from eastern Ontario and western Quebec, in the general region from Lake Temiskaming to Lake Abitibi, collected by Mr. W. B. Brierly and Mr. W. H. Hodge.

Three years ago under the leadership of the senior author the Hadwen Botanical Club was formed. It was named in honor of Obadiah B. Hadwen, a resident of Worcester, who, at his death, bequeathed to the University his estate, the same to be used as an arboretum. The main purpose of the Club is to stimulate interest concerning plants and bring together those botanically minded people in and about Worcester who for some time have been more or less "lone-star rangers." The first problem of the Club is to make a very thorough survey of the flora of the county, and although only just past its second collecting season, the herbarium of the club now numbers approximately 3000 sheets.

Due to the Club's activity and that of those connected with the Natural History Society a number of plants new to the county have been found, and it is thought advisable to publish at this time a list of this new material. It is a pleasure to record thanks to all the people who have contributed to this work. Special thanks are due to Mrs. R. B. Dodge for her unfailing interest and careful work, to Mrs. D. L. Salter for her contributions to the families Gramineae and Cyperaceae, to Mr. Cyrus Darling for his work on the Ferns, and to Mr. Earl W. Bemis for his many valuable contributions.

The plants enumerated in the following list are arranged by families

[1] Potter, David., Plants collected in the Southern Region of James Bay. RHODORA, 36: 274–284. 1934.

according to the system used in Gray's Manual, 7th edition. In each case the species listed is accompanied by the name of the person who first discovered and reported the plant as growing within the county, the township where found, the date of finding and, where an herbarium sheet exists, its place of deposition. For this purpose the following key is used.

C. The Herbaria of Clark University and the Hadwen Botanical Club.
W. The Herbarium of the Worcester Society of Natural History.
S. The private Herbarium of Mrs. D. L. Salter, Worcester, Mass.
G. The Gray Herbarium (including the Herbarium of the New England Botanical Club) at Harvard University.

In a few cases no herbarium sheet exists, but it is the hope of the authors that these omissions will soon be rectified. It is thought best to report these plants even though the pressed specimen is lacking, since in each instance the person reporting the same is thoroughly reliable.

Polypodium virginianum L., forma elongatum (Jewell) Fernald. C. Leicester, July 15, 1933. *Cyrus Darling.*

Polystichum acrostichoides (Michx.) Schott, forma incisum (Gray) Gilbert. C. Holden, July 31, 1933. *Cyrus Darling.*

Sorghum halepense (L.) Pers. S. Hubbardston, Sept. 15, 1930. *D. L. Salter.*

Paspalum pubescens Muhl. (See Weatherby, Rh. **30**: 128). C. Westminster, Aug. 15, 1930. *C. M. Litch.* Also *D. L. Salter,* Worcester, Sept. 15, 1930.

Panicum linearifolium Scribn., var. Werneri (Scribn.) Fernald. C. Fitchburg, June 7, 1932. Rh. **36**: 65. *C. M. Litch.*

Panicum lanuginosum Elliott, var. fasciculatum (Torr.) Fernald. C. Fitchburg, June 15, 1932. *C. M. Litch.*

Panicum oligosanthes Schultes, var. Scribnerianum (Nash) Fernald. C. Fitchburg, June 7, 1932. Rh. **36**: 80. *C. M. Litch.*

Panicum Tuckermani Fernald. Rh. **21**: 110. G. Shrewsbury, Nov. 27, 1929. *Earl W. Bemis.*

Anthoxanthum odoratum L., var. villosum Loisel. G. Paxton, June 10, 1933. "Peculiar in the sessile spikes." *Earl W. Bemis.*

Sporobolus neglectus Nash. S. Worcester, Oct. 9, 1932. *D. L. Salter.*

Agrostis alba L., var. vulgaris (With.) Thurb. S. C. Worcester, July 15, 1929. *D. L. Salter.*

Deschampsia caespitosa (L.) Beauv., var. parviflora (Thuill.) Richter. W. Tatnuck, Sept. 25, 1931. *Clarence W. Kinney.* Found in garden soil. A second record for Mass.

Avena sativa L. July 9, 1927. *Norman P. Woodward.* Common

about dumps and new home sites. No herbarium sheet of the above specimen. This plant has been collected and herbarium sheets are now in the collection of the Hadwen Botanical Club from Worcester, Auburn, Millbury and Princeton.

Eragrostis pectinacea (Michx.) Steud. S. C. Holden, Aug. 5, 1928. *D. L. Salter.*

Eragrostis peregina Wiegand. S. Worcester, Sept. 15, 1930. *D. L. Salter.*

Poa nemoralis L. S. C. Worcester, June 2, 1930. *D. L. Salter.*

Poa trivialis L. S. Upton, June 20, 1931. *D. L. Salter.*

Poa alsodes Gray. S. Worcester, May, 1930. *D. L. Salter.*

Glyceria grandis Wats. S. C. W. Worcester, July 20, 1928. *D. L. Salter.*

Glyceria borealis (Nash) Batchelder. G. Boylston, July 30, 1928. *Earl W. Bemis.* Several plants in shallow water.

Festuca rubra L. S. Leicester, June 21, 1930. *D. L. Salter.*

Festuca ovina L., var. hispidula Hack. S. C. Worcester, June 20, 1928. *D. L. Salter.*

Festuca ovina L., var. capillata (Lam.) Hack. S. Worcester, June 20, 1930. *D. L. Salter.*

Bromus hordeaceus L. S. Worcester, June 20, 1932. *D. L. Salter.*

Bromus commutatus Schrad. S. C. Worcester, Aug. 1, 1929. *D. L. Salter.*

Bromus ciliatus L., var. intonsus Fernald. G. Shrewsbury, Oct. 21, 1932. *Earl W. Bemis.* The common New England form. Rh. **32**: 70.

Bromus purgans L. S. Hubbardston, August, 1929. *D. L. Salter.*

Bromus inermis Leyss. S. C. Worcester, July 4, 1930. *D. L. Salter.*

Lolium multiflorum Lam. C. W. Worcester, June 10, 1929. *D. L. Salter.*

Triticum sativum Lam. Worcester, June 22, 1929. *Norman P. Woodward.* No herbarium sheet, frequent about the city on dumps.

Cyperus rivularis Kunth. G. Boylston, Aug. 17, 1930. *Earl W. Bemis.*

Cyperus erythrorhizos Muhl. G. Boylston, Aug. 21, 1930. *Earl W. Bemis.*

Cyperus strigosus L., var. capitatus Boeckl. G. Boylston, Aug. 21, 1930. *Earl W. Bemis.*

Cyperus strigosus L., var. compositus Britton. G. Boylston, Aug. 21, 1930. *Earl W. Bemis.*

Fimbristylis Frankii Steud. G. Shrewsbury, Nov. 27, 1929. *Earl W. Bemis.*

Scirpus sylvaticus L., var. Bissellii Fernald. G. Bolton. *F. F. Forbes.* Also in Worcester by *Earl W. Bemis,* Aug. 21, 1933.

Rh. **36**: 7. *C. A. Weatherby* writes as follows: "Scirpus sylvaticus v. Bissellii . . . is always rare, but the sort of variation which I should expect to turn up now and then wherever the typical form is found."

Carex scoparia Schkuhr, var. moniliformis (Tuckerm.) Kukenth. G. Shrewsbury, June 25, 1933. *Earl W. Bemis.*

Carex scoparia Schkuhr, var. condensa Fernald. S. Worcester, June 21, 1930. *D. L. Salter.*

Carex projecta Mackenzie (*C. tribuloides* Wahlenb., var. *reducta* Bailey). G. Shrewsbury, June 20, 1933. *Earl W. Bemis.*

Carex siccata Dewey. S. Oakham, May 30, 1932. *D. L. Salter.* Also by *Earl W. Bemis* in Boylston, June 18, 1933.

Carex Merritt-Fernaldii Mackenzie (*C. festucacea* of Gray's Manual, 7th ed.) G. Paxton, June 27, 1933. *Earl W. Bemis.*

Carex brevior (Dewey) Mackenzie (*C. festucacea* Schkuhr, var. *brevior* (Dewey) Fernald). S. Grafton, May 23, 1930. *D. L. Salter.* Also by *Earl W. Bemis* in Paxton, June 10, 1933.

Carex foenea Willd., var. perplexa Bailey. S. Worcester, June 14, 1930. *D. L. Salter.*

Carex leporina L. S. Worcester, June 18, 1931. *D. L. Salter.* Also by *Earl W. Bemis* in Paxton, June 28, 1933.

Carex angustior Mackenzie (*C. stellulata* Good., var. *angustata* Carey). C. Ashburnham, June 22, 1931. *C. M. Litch.* Also by *R. H. Lombard* in Spencer, June 2, 1933, and by *Earl W. Bemis* in Paxton, June 10, 1933.

Carex seorsa E. C. Howe. G. Paxton, June 10, 1933. "Not common anywhere." *Earl W. Bemis.* See Rh. **36**: 8.

Carex canescens L., var. subloliacea Laestad. S. Holden, May 22, 1930. *D. L. Salter.* Also by *Earl W. Bemis* in Boylston, June 20, 1933.

Carex trisperma Wahlenb., var. Billingsii Knight. G. Boylston, Oct. 17, 1932. *Earl W. Bemis.*

Carex annectens Bickn., (*C. setacea* Dewey, var. *ambigua* (Barratt) Fernald). G. Paxton, July 4, 1933. *Earl W. Bemis.*

Carex crinita Lam., var. gynandra (Schwein.) Schwein. & Torr. C. Fitchburg, June 26, 1932. *C. M. Litch.*

Carex stricta Lam., var. decora Bailey. S. Worcester, June 15, 1930. *D. L. Salter.*

Carex pennsylvanica Lam., var. distans Peck (*C. penn.*, var. *lucorum* (Willd.) Fernald). S. Sutton, May 11, 1930. *D. L. Salter.* Also by *Earl W. Bemis* in Worcester, July 20, 1933.

Carex caryophyllea Lat. S. Worcester, June 10, 1930. *D. L. Salter.*

Carex paupercula Michx., var. irrigua (Wahlenb.) Fernald. S. Worcester, June 11, 1932. *D. L. Salter.*

Carex debilis Michx., var. Rudgei Bailey. S. Worcester, May 24, 1930. *D. L. Salter.*

Carex lupulina Muhl., var. pedunculata Dewey. G. Boylston, Oct. 10, 1932. *Earl W. Bemis.*

Carex vesicaria L. S. Auburn, June 8, 1933. *D. L. Salter.*

Carex rostrata Stokes. G. Boylston, Oct. 14, 1932. *Earl W. Bemis.*

Carex rostrata Stokes, var. ambigens Fernald. S. Princeton, Sept. 5, 1932. *D. L. Salter.*

Juncus macer S. F. Gray, var. anthelatus (Wiegand) Fernald. (*J. tenuis* Willd., var. *anthelatus* Wiegand). G. Worcester, Aug. 6, 1933. *Earl W. Bemis.*

Juncus macer S. F. Gray, var. Williamsii Fernald. (*J. tenuis* Willd., var. *Williamsii* Fernald). G. Worcester, Aug. 6, 1933. *Earl W. Bemis.*

Juncus secundus Beauv. G. East Douglas, Aug. 19, 1933. *Earl W. Bemis.*

Juncus articulatus L. G. Paxton, Sept. 20, 1927. *Earl W. Bemis.*

Hosta caerulea (Andr.) Tratt. West Boylston, July 28, 1916. No herbarium sheet, a frequent escape. *Norman P. Woodward.*

Convallaria majalis L. Boylston, May 30, 1928. *Earl W. Bemis.* No herbarium sheet of this plant from this location.

Trillium erectum L., forma albiflorum R. Hoff. W. Tatnuck, May 15, 1932. *Clarence W. Kinney.* Also by *Mrs. R. B. Dodge* in Petersham. See Proc. Bost Soc. Nat. Hist. **36**: 244.

Narcissus Pseudo-Narcissus L. Worcester, May 3, 1933. *Norman P. Woodward.* No herbarium sheet, an escape, in open woods.

Narcissus poeticus L. W. Worcester, May 24, 1933. *Norman P. Woodward.* An escape, Peat Meadow (3 plants).

Iris variegata L. Worcester, June 4, 1923. *Norman P. Woodward.* No herbarium sheet, an escape, now established near Chadwick Square.

Cypripedium acaule Ait., forma albiflorum Rand & Redfield. Worcester (Rattlesnake Hill), June 14, 1920. *Norman P. Woodward.* No herbarium sheet, rare.

Pogonia ophioglossoides (L.) Ker., forma albiflora Rand & Redfield. Oxford, July 7, 1928. *Earl W. Bemis.* No herbarium sheet.

Spiranthes Romanzoffiana Cham. C. Leicester, July 24, 1932. *Cyrus Darling.*

Juglans nigra L. Worcester, June 2, 1922. No herbarium sheet. Occasionally about the city. *Mrs. R. B. Dodge.*

Alnus crispa (Ait.) Pursh, var. mollis Fernald. C. W. Harvard (Still River), Oct. 8, 1932. Rh. **15**: 44 for citation. *Mrs. Frank E. Lowe.*

Rumex persicarioides L. W. Worcester (Peat Meadow), Aug. 28, 1928. "A second record for New England." *Norman P. Woodward.*

Rumex Acetosa L. W. Oakham, July 1, 1928. *Mrs. R. B. Dodge.*

Polygonum aviculare L., var. littorale (Link) Koch. W. Worcester, Sept. 9, 1931. Sandy beach, Lake Quinsigamond. *Norman P. Woodward.*

Chenopodium leptophyllum Nutt. W. Worcester, Aug. 10, 1930. Spontaneous in garden. Rare. *Mrs. John W. Kemp.*

Cerastium tomentosum L. Worcester (Peat Meadow), June 8, 1930. No herbarium sheet. An escape in waste land. *Mrs. R. B. Dodge.*

Gypsophila paniculata L. W. Worcester, July 25, 1928. An escape in waste land. *Norman P. Woodward.*

Tunica Saxifraga (L.) Scop. W. Worcester (Waconah Road), July 30, 1932. *Mrs. R. B. Dodge.*

Dianthus Caryophyllus L. Worcester (Peat Meadow), June 29, 1929. No herbarium sheet. A garden escape. *Mrs. R. B. Dodge.*

Aguilegia canadensis L., forma Phippenii (J. Robinson) R. Hoffman. G. Boylston, May 1, 1925. *Earl W. Bemis.* Also *N. P. Woodward* in Worcester, May 27, 1933.

Cheiranthus Allioni Hort. W. Worcester (Peat Meadow), June 29, 1929. A horticultural variety, probably a hybrid. *Mrs. R. B. Dodge.*

Arabis Drummondi Gray. W. Berlin, May 15, 1933. *Mrs. R. B. Dodge.*

Philadelphus coronarius L. Worcester, June 21, 1928. No herbarium sheet. Escaped and established. *Norman P. Woodward.*

Spiraea japonica L. f. Worcester (Peat Meadow), Sept. 5, 1927. No herbarium sheet. An escape. *Norman P. Woodward.*

Spiraea prunifolia Sieb. & Zucc. Shrewsbury, June 3, 1925. No herbarium sheet. Along the lake shore. *Norman P. Woodward.*

Pyrus prunifolia Willd. W. Worcester (Chadwick Sq.) Sept. 1, 1926. *Norman P. Woodward.*

Pyrus japonica Thunb. Sutton, June 6, 1928. No herbarium sheet. An escape from garden. (Conn. Flora, 1910, p. 224. *Cydonia japonica* (Thunb.) Pers.). *Mrs. John W. Kemp.*

Amelanchier stolonifera Wieg. W. Worcester, May 16, 1933. See Rh. **14**: 144. *Mrs. Frank E. Lowe.*

Rhodotypos kerrioides Sieb. & Zucc. Worcester (June St.) May 21, 1932. No herbarium sheet. An escape. *Norman P. Woodward.*

Sanguisorba annua Nutt. W. Worcester (Peat Meadow), Sept. 22, 1930. In grading near building. A fugitive from the west. *Mrs. R. B. Dodge.*

Rosa setigera Michx. W. Worcester (Peat Meadow) July 21, 1929. *Mrs. R. B. Dodge.* Also *N. P. Woodward* in Worcester, July 13, 1930.

Rosa suffulta Greene. C. Worcester, Aug. 25, 1932. *Cyrus Darling.*

Prunus Cerasus L. Leicester, May 19, 1932. No herbarium sheet. Rare. *Mrs. R. B. Dodge.*

Vicia villosa Roth. W. Harvard (sandy pasture), June 8, 1933. *Mrs. R. B. Dodge and Mrs. Frank E. Lowe.*

Phaseolus multiflorus Willd. Worcester, Aug. 24, 1928. No herbarium sheet. An escape on dump. *Mrs. R. B. Dodge.*

Geranium pratense L. W. Tatnuck, May 21, 1932. Spont. in garden. *Clarence W. Kinney.* Seen in Sturbridge by *Mrs. R. B. Dodge*, June 8, 1933.

Acalypha gracilens Gray. W. Paxton, Aug. 29, 1926. *Earl W. Bemis.* Also *George Pride* in Worcester, Sept. 2, 1928.

Euphorbia marginata Pursh. W. Worcester, Aug. 2, 1928. *Norman P. Woodward.*

Evonymus europaeus L. W. Worcester, June 4, 1930. An established escape. *Mrs. R. B. Dodge.*

Acer Pseudo-Platanus L. W. Worcester, June 20, 1930. Occasionally spontaneous about the city. *Norman P. Woodward.*

Acer platanoides L. W. Worcester, May 27, 1933. Dried-up brook bed. Spontaneous about the city. *Norman P. Woodward.*

Impatiens biflora Walt., forma immaculata Weatherby. Worcester, Sept. 4, 1916. No herbarium sheet. Water hole, Lake Park. (Add. to Conn. Flora, 1930, p. 63 for citation). *Norman P. Woodward.*

Malva moschata L., var. alba Hort. W. Worcester (Peat Meadow), Aug. 4, 1927. An escape. *Norman P. Woodward.*

Malva Alcea L. W. Worcester (Peat Meadow), July 13, 1930. A rare escape. *Mrs. R. B. Dodge.*

Viola striata Ait. W. Tatnuck, May 13, 1929. *Clarence W. Kinney.* Also *Mrs. R. B. Dodge* in Fiskdale.

Viola arvensis Murr. W. Worcester, May 15, 1932. *Mrs. R. B. Dodge.*

Viola Rafinesquii Greene. W. Worcester, May 28, 1930. *Norman P. Woodward.*

Eryngium amethystinum L. W. Worcester, July 11, 1931. Escaped in grassland. *Norman P. Woodward.*

Lysimachia punctata L. W. Sturbridge, June 28, 1929. *Mrs. R. B. Dodge.*

Hydrophyllum canadense L. W. Worcester, June 22, 1933. *Walter S. Young.* No herbarium sheet of this specimen reported by Mr. Young. The herbarium specimen is that of *Mr. N. P. Woodward*, collected in Worcester, July 11, 1933.

Verbena hastata L., forma rosea Cheney. Worcester, Aug. 20, 1924. No herbarium sheet. See Rh. **4**: 245 for citation. *Norman P. Woodward.*

Prunella vulgaris L., var. lanceolata (Barton) Fernald. W. Worcester, July 27, 1927. See Rh. **15**: 182 for citation. *Norman P. Woodward.*

Monarda fistulosa L., var. rubra Gray. W. Worcester (Peat Meadow), July 18, 1921. *Norman P. Woodward.*

Physalis pubescens L. W. C. Worcester (Brattle St.) June 20, 1933. *Mrs. R. B. Dodge.*

Eupatorium coelestinum L. W. Worcester, Sept. 13, 1928. Escape into waste land. *Norman P. Woodward.*

Liatris spicata (L.) Willd. W. Worcester, Sept. 21, 1932. First specimen from New England in the Gray Herbarium. *Norman P. Woodward.*

Bellis perennis L. W. Worcester, May 17, 1933. Spont. in lawns. 4 records. *Norman P. Woodward.*

Aster pilosus Willd. Holden, Sept. 10, 1930. Herbarium sheet in the U. S. Dept. Agri. checked by S. F. Blake. See Rh. **32**: 139 for citation. *Earl W. Bemis.*

Aster amethystinus Nutt., forma leucerythros Bemis. G. Worcester, Oct. 5, 1924. *Earl W. Bemis.* A new form reported by Mr. Bemis in Rh. **32**: 3. Herbarium sheets are also at the Worc. Nat. Hist. Mus. (*Mrs. R. B. Dodge*) (Type in the Gray Herbarium).

Aster amethystinus Nutt., forma leucos Bemis. G. Worcester, Sept. 24, 1930. *Earl W. Bemis.* A new form reported by Mr. Bemis in Rh. **33**: 63. (Type in the Gray Herbarium.)

Aster linariifolius L., forma leucactis Blake. Worcester, Sept. 25, 1926. No herbarium sheet. *Mrs. Frank E. Lowe.* A good stand, a part of which was transplanted to Mrs. Lowe's wild garden where always available. See Rh. **34**: 12 for citation.

Rudbeckia hirta L., forma viridiflora S. H. Burnham. Worcester. Noted in 1928, 1929 and August 22, 1931. No herbarium sheet. Spontaneous in Museum grounds. Several plants. *G. H. Pride.*

Madia sativa Molina, var. congesta T. & G. Worcester (Rice Square), Oct. 28, 1928. No herbarium sheet. *George H. Pride.* Also by *Mrs. R. B. Dodge* in Worcester, June 29, 1929. Herbarium sheet at the Nat. Hist. Soc.

Clark University,
Worcester, Mass.

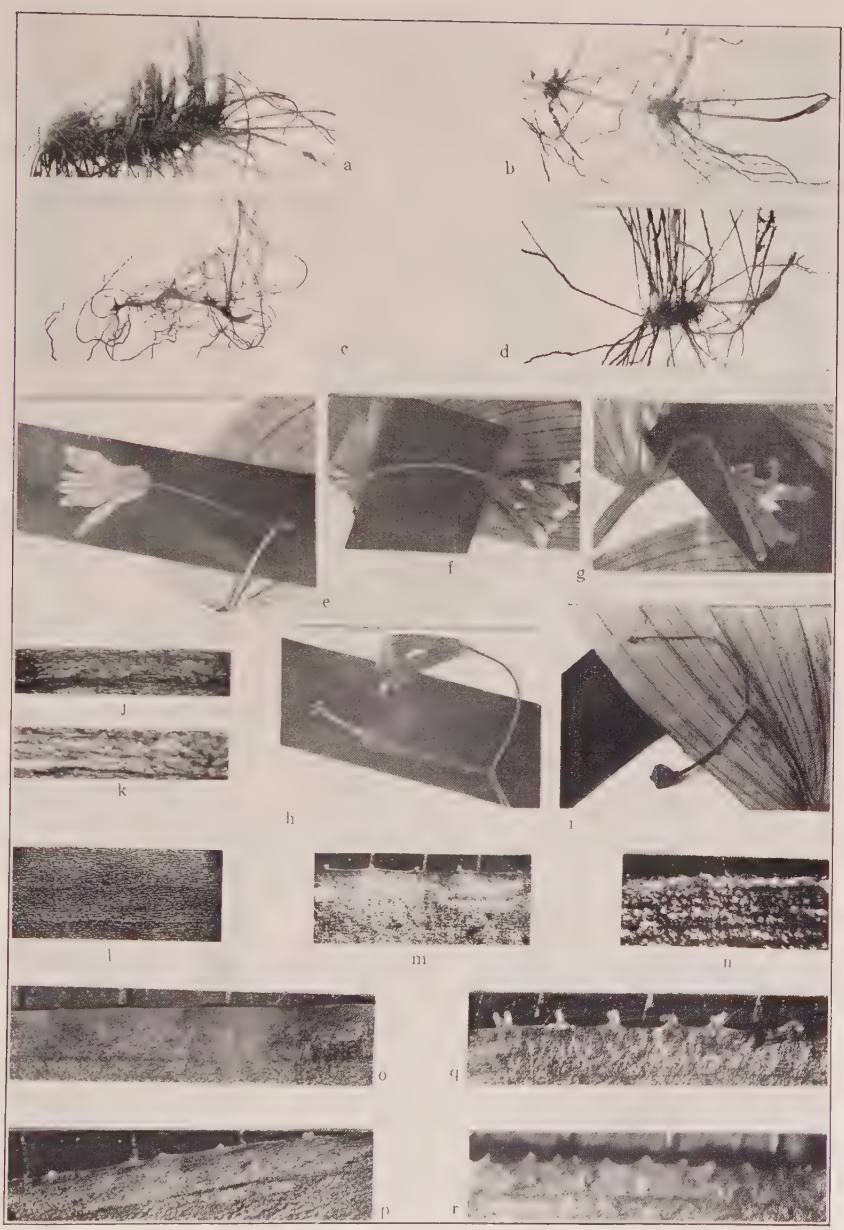
NOTES FROM THE HERBARIUM OF THE UNIVERSITY OF WISCONSIN—XII.
A STUDY OF STREPTOPUS[1]

Norman C. Fassett

Plate 328

This study is based on the material in the Gray Herbarium, the United States National Herbarium, The New York Botanical Garden, the University of Minnesota, the Field Museum of Chicago, the University of Michigan, the University of Montreal, the University of Tennessee, the University of North Carolina, the National Museum of Canada, the Milwaukee Public Museum, the University of Wisconsin,

[1] Printed with aid to Rhodora from the National Academy of Sciences.



DETAILS OF STREPTOPUS.

FIGS. *a–d*, Rootstocks, × ½: *a*, of S. ROSEUS var. PERSPECTUS; *b*, of S. ROSEUS var. LONGIPES; *c* and *d*, of intermediate forms. FIGS. *e–i*, Peduncles and pedicels or flowers, × 1½: *e*, of S. OBTUSATUS; *f*, of S. ROSEUS var. PERSPECTUS; *g*, of S. ROSEUS var. TYPICUS; *h*, of S. ROSEUS var. PERSPECTUS; *i*, of S. ROSEUS var. TYPICUS. FIGS. *j* and *k*, Inner surface of sepal: *j*, of S. ROSEUS var. PERSPECTUS; *k*, of S. ROSEUS var. CURVIPES. FIG. *l*, Lower surface of leaf, S. AMPLEXIFOLIUS var. CHALAZATUS. FIG. *m*, Lower surface and margin of leaf, S. AMPLEX var. DENTICULATUS. FIGS. *n–r*, leaf-margins: *n*, of S. STREPTOPOIDES var. BREVIPES; *o*, of S. AMPLEX. var. AMERICANUS; *p*, of S. AMPLEX. var. DENTICULATUS; *q*, of S. AMPLEX. var. OREOPOLUS; *r*, of S. AMPLEX. var. DENTICULATUS.

and the private herbaria of Mr. C. C. Deam and of Prof. E. Lucy Braun. The writer wishes to express his appreciation to the officials of those herbaria from which he has borrowed material. He is also indebted to Mr. C. A. Weatherby, Professor M. L. Fernald, Professor F. K. Butters, and Professor F. C. Gates for their help in dealing with many phases of this work. To Professor A. J. Eames he is grateful for his notes on stem structure, quoted below.

Generic Characters

Streptopus: perennial herbs, from horizontal rootstocks; stem simple to several times forking; leaves elliptic or ovate, more or less tapering at tip and from sessile to somewhat clasping at base; peduncles supra-axillary, usually fused for some distance with the stem; perianth of 6 separate segments, campanulate or rotate; sepals usually a little broader than the petals; stamens 6; anthers apiculate to aristate at tip; filaments dilated; fruit a berry.

Very characteristic in this genus is the fusion of the lower part of the peduncle with the stem. This has been suggested by Arber[1] in the case of *S. amplexifolius*. Goebel,[2] on the other hand, interprets the arrangement as a sympodium, with each flower terminal, and the apparent extension of the main stem actually an axillary outgrowth. That Arber's suggestion is more correct is indicated by a study of other species. In *S. simplex* (fig. 1) we find the peduncles borne in an axillary position, but actually leaving the stem at a point a short distance above the leaf. For this short distance, then, the peduncle is fused with the stem; this fused portion is exaggerated in the drawing. In *S. parviflorus* (fig. 2) the same condition obtains, except that the fused portion is longer, bringing the emergence of the peduncle close to the leaf next above. In *S. amplexifolius* (fig. 3) the peduncle leaves the stem at a point very close to the leaf next above that in whose axil it was borne, and is often slightly fused with the margin of that leaf. Moreover, the peduncle as it leaves the stem is so twisted that the flower is not directly over the leaf in whose axil it actually arose, but on the opposite side of the stem, hanging under the leaf next above. In all the drawings, the fused portion of the peduncle is indicated by a heavy line. In the plants, there is a low ridge on that side, which is not as conspicuous as the drawings would indicate.

The remaining species have an inflorescence like that of *S. amplexifolius*. Professor A. J. Eames, who has examined microscopically material of *S. oreopolus* collected by the writer on Mt. Washington,

[1] Plant Life in Alpine Switzerland, 256 (1910).
[2] Blütenbildung und Sprossgestaltung, 44–45 (1931)

Fig. 1. Streptopus simplex.

Fig. 2. Streptopus parviflorus.

Fig. 3. Streptopus amplexifolius.

New Hampshire, writes me: "I am sorry to say that there is no convincing evidence internally of the fusion. I had hoped to find it, but the union has apparently become very intimate. This does not mean that I do not think the fusion has not occurred. It surely has. The sections show clearly the unusual relationships of the leaf and peduncle."

The peduncle is sometimes branched, as is shown in FIG. 3, and at the point of branching is a minute bract or gland, representing, no doubt, a leaf. In the case of an unbranched peduncle, there is still a bract or gland in most cases; that this actually represents a leaf is shown by an individual of *S. longipes* which grew in the writer's garden, and which had at that point a green leaf 2 cm. long and several millimeters wide. The portion of the flowering stalk beyond the bract is obviously a pedicel.

S. paniculatus Baker, in Hook, Icon. Pl. xx. t. 1932 (1890) has a very different type of inflorescence, and is out of place in the genus *Streptopus;* the writer will leave to some one more familiar than he with the flora of Asia the placing of this species in its correct genus.

Whether or not *Kruhsea* is treated as a separate genus must rest upon personal judgment. To the writer, two facts seem to warrant the merging of *Kruhsea* with *Streptopus.* The first is the same unique type of inflorescence found in both. The second is the parallelism shown by the variations within each group; the variations in rootstocks, dentation of leaf-margins, and even papillation of perianth-segments, found in *Streptopus* proper, have their counterparts in *Kruhsea.* Only the rotate corolla and sessile stigma separate *Kruhsea* from *Streptopus.* They might stand as not very distinct genera, but as two sections of one genus they are well marked. As for the recently proposed genus *Tortipes,*[1] including only *T. amplexifolius:* if *S. amplexifolius* is treated as a genus distinct from *S. roseus,* then *S. simplex* and *S. parviflorus* are both distinct genera also, and the seven species here distinguished comprise five genera instead of one.

Systematic Treatment

The seven species of *Streptopus* here considered are remarkably distinct, in spite of the similarity of habits throughout the genus. Within several of the species there is considerable variation, but the variation in no cases results in the overlapping of species.

[1] Small, Man. Southeastern Fl. 298 (1933).

a. Perianth campanulate; style filiform; flower-stalk (except often in nos. 1 and 2) with a gland or bractlet representing junction of peduncle and pedicel; nodes glabrous or fringed....*b.*

b. Peduncle emerging from the stem directly above the leaf in whose axil it was borne, and not at all fused with the leaf next above....*c.*

Peduncle only slightly supra-axillary, emerging from the stem at a point close to the leaf in whose axil it was borne; perianth 1 cm. or more long; anther longer than the filament; style-branches nearly 2 mm. long.....1. *S. simplex.*

Peduncle emerging from the stem near the leaf next above that in whose axil it was borne; perianth 8 mm. or less long; anther shorter than the filament; style-branches 1 mm. or less long.....2. *S. parviflorus.*

b. Peduncle twisted at its emergence from the stem, so that it hangs under, and is often slightly fused with, the margin of the leaf next above that in whose axil it arose....*c.*

c. The distal third to half of each perianth-segment widely spreading or strongly recurved at tip; stigma barely 3-lobed; anthers tapering to an entire point; nodes glabrous; leaves cordate-clasping at base.....3. *S. amplexifolius.*

d. Pedicels 8–18 mm. long, usually exceeding the flower or mature fruit; leaves distal to the uppermost flower 3–5, rarely only 1.....var. *genuinus.*

d. Pedicels rarely exceeding 1 cm. in length, usually shorter than the flower or mature fruit; leaves distal to the uppermost flower 1–3, very rarely 4, or the branch sometimes terminated by a flower....*e.*

e. Leaf-margins entire or with very minute scattered teeth not exceeding 6 per cm....*f.*

f. Leaves minutely but copiously papillate beneath. var. *chalazatus.*

f. Leaves not papillate beneath.....var. *americanus.*

e. Leaf-margins with 10–40 minute teeth per cm., these mostly rather regularly distributed....*g.*

g. Leaf-margins with 10–25 teeth per cm., these mostly wider at base than long; pedicels and leaf-surfaces always glabrous....*h.*

h. Perianth with a spread of 7–16 mm., its segments 7–13 mm. long.

Perianth with a spread of 7–9 mm., its segments 7–9 mm. long; leaves not glaucous beneath.....var. *papillatus.*

Perianth with a spread of 9–16 mm., its segments 8–13 mm. long; leaves glaucous beneath.....var. *denticulatus.*

h. Perianth with a spread of 13–26 mm., its segments 13–17 mm. long.....var. *grandiflorus.*

g. Leaf-margins with 22–40 teeth per cm., these mostly longer than broad or even resembling the cilia of *S. roseus;* pedicels sometimes ciliate; leaves often with scattered hairs below.....var. *oreopolus.*

c. Perianth-lobes slightly if at all spreading at tip; anthers 2-pointed; stigmas definitely 3-parted at tip....*i.*

i. Leaves clasping the stem; stem and peduncles glabrous; nodes not fringed; styles 3-lobed 2/3 of the way to the base; anthers long-triangular, the sides tapering from base to apex; perianth-segments obtuse or rounded at tip.....4. *S. obtusatus.*

i. Leaves sessile but not clasping; stem and usually the peduncles ciliate with multicellular hairs; nodes

fringed; style 3-lobed less than ¼ of the way to the base; anthers ovate, the sides rounded; perianth-segments acute to acuminate (the tips often withering in pressed specimens) ..... 5. *S. roseus.*

j. Rootstock matted, the internodes so short as usually to be obscured by the copious roots, and to cause the current year's stem to appear close beside the remains of last year's; leaves with 22–60, mostly 30–50, cilia per cm.; perianth-segments glabrous within, or rarely with microscopic long low papillae; sepals (7–)9–11-nerved; style-branches mostly ascending .... *k.*

k. Pedicels glabrous ..... var. *typicus.*

k. Pedicels ciliate with multicellular hairs .... *l.*

l. Perianth 6–10 mm. long; stamens 2.5–5.5 mm. long; mucro on anthers 0.2–0.5 mm. long; style-branches 0.2–0.7 mm. long ..... var. *perspectus.*

l. Perianth 10–12 mm. long; stamens 5–7 mm. long; mucro on anthers 0.5–1.0 mm. long; style-branches 1.1 mm. long .. var. *perspectus*, f. *giganteus.*

j. Rootstock slender, wide-creeping, with internodes several cm. long and small tufts of roots at the nodes; leaves with rarely more than 30 cilia per cm.; perianth-segments minutely papillate-pubescent within; sepals 3–5-nerved; style-branches often spreading.

Stems often branched; leaves mostly with 20–30 cilia per cm.; peduncle and pedicel together 6–22(–42) mm. long; papillae of perianth about 28 mu long. ..... var. *longipes.*

Stems usually simple; leaves entire on the margins or with 16 (rarely –20) or fewer cilia per cm.; peduncle and pedicel together 5–15 (–20) mm. long; papillae of perianth 30–75 mu long. .. var. *curvipes.*

a. Perianth rotate; style absent, stigma conical and sessile; flower-stalk without a gland; nodes fringed .... *m.*

m. Perianth-segments not papillate within, sometimes finely pubescent toward the tip; peduncles 3–15 mm. long; leaves margined with minute tooth-like hyaline cells, sometimes also ciliate ..... 6. *S. streptopoides.*

n. Fruit red .... *o.*

o. Leaves ciliate ..... var. *verus.*

o. Leaves not ciliate .... *p.*

p. Plant 8–20 cm. high, mostly simple; petals with cupped or revolute margins ..... var. *brevipes.*

p. Plant reaching 3 dm. in height, often forking; petals plane ..... var. *japonicus.*

n. Fruit black ..... var. *atrocarpus.*

m. Perianth-segments papillate within; peduncles 1.5–3 cm. long; leaves ciliate, without tooth-like marginal cells .... 7. *S. koreanus.*

1. S. SIMPLEX Don, Prod. Fl. Nepal 48 (1825) and Trans. Linn. Soc. xviii. 530 (1841); Schultes fil. Syst. Veg. vii. 312 (1829). *S. candida* Wall. Cat. no. 5112 (1828). *Hekorima candida* Kunth, Enum. iv. 204 (1843).—Specimens examined[1]: INDIA: Sikkim, alt. 12000 ft., *J. D. Hooker* (Gray); Sikkim, alt. 16000 ft., July, 1878, *Dr. King's collector,*

[1] The location of cited specimens is indicated by abbreviations in parentheses as follows: (Gray) Gray Herbarium, Cambridge, Massachusetts; (U. S.) United States National Herbarium, Washington, D. C.; (N. Y.) New York Botanical Garden; (Field) Field Museum of Chicago.

(Gray); amongst scrub and in open forests on w. flank of N'Maikha-Salwin divide, 11000 ft., Upper Burma, June, 1925, *G. Forrest*, no. 26877 (U. S.; N. Y.); margins of thickets on w. flank of N'Maikha-Salwin divide, 13000 ft., Upper Burma, September, 1925, *Forrest*, no. 27255 (U. S.). China: Mount Lauchünchan, southwest of the Yangste bend at Shiku, Yunnan, June, 1923, *J. F. Rock*, no. 9571 (Gray; U. S.; N. Y.); Tibet Himalaya, July 22, 1877, *G. King*, no. 4273 (U. S.); shade of spruce forest, alt. 12,000 feet, Mt. Kenichunpo, May–July, 1932, *Rock*, no. 21947 (N. Y.).

2. S. parviflorus Franch., Nouv. Arch. Mus. Paris, Sér. II. x. 89[1] (1888); Pl. Dav. 127 (1889). Since the original description is not available in most libraries, it is here reprinted: "Glaberrimus; caulis gracilis, dichotomus; folia late amplexicaulia, ovato-lanceolata, acuminata, subtus glauca; pedicelli capillares, erecti vel ascendentes; flores ex axillis solitarii, albi, parvi; perianthii campanulati segmenta erecta oblonga obtusa; stamina perianthio subduplo breviora, filamentis e basi paulo latiore late linearibus antheras oblongas breviter bicuspidatas saltem aequantibus; stylus stamina vix aequans, breviter tricuspidatus; baccae . . .

"Pedalis usque bipedalis; folia 2–3 poll. longa, 2–2½ cent. lata; pedunculi pollicares; perianthium 6 mill. longum.

"Moupine, in silvis umbrosis. Fl. Jun. 1869.

"Plante grêle à feuilles glauques en dessous; elle tient le milieu entre le *S. simplex* et le *S. roseus* Mich.; elle diffère du premier par ses fleurs deux fois plus petites, par son style très brièvement tricuspidé et non pas divisé presque jusqu'au milieu par ses anthères égalant à peine le filet et non pas une fois plus longues. Il se distingue du second par l'absence complète de poils sur les pédicelles, sur la tige et sur le bord des feuilles, par le périanthe à lobes très obtus et ne se recourbant pas en dehors."

On one of the specimens cited below, the fruit is noted as being "red, berry-like, triangular."

Specimens examined: China: Szechuan: Nanchuan Hsien, 1928, *W. P. Fang*, no. 1143 (Gray; N. Y.); Omei Hsien, Mt. Omei, 1928, *Fang*, no. 2831 (Gray); near Tachienlu, at 9000–13,500 ft., *A. E. Pratt*, no. 52 (Gray); western Szechuan, August, 1908, *E. H. Wilson*, no. 926 (Gray; U. S.). Yunnan: Chungtien, alt. 3600 m., August, 1914, *Camillo Schneider*, no. 2391 (Gray).

There is nothing in the description of *S. Mairei* Levéillé, Bull. Geogr. Bot. xxv. 39 (1915), to indicate that it differs from *S. parviflorus*. This description, kindly supplied by Miss Vincent and Mr. Standley of the Field Museum, is as follows: "Peraffinis *S. amplexifolio* a quo tamen diversus *foliis subtus glaucis* et *pedicello* florali non *articulato*. Flores albi 4–7 mm. diametientes. Yun-Nan: pâtures du plateau de Ta-Hai, 3200 m., Juillet 1912 (*E. E. Maire*)."

[1] The Kew Index lists this as page 90, but the description begins on the previous page. I am indebted to Miss Amy Hepburn of the Columbia University Library for a copy of this description.

3. S. AMPLEXIFOLIUS (L.) DC. in Lam. & DC. Fl. de France iii. 174 (1805).

This species is variable in several respects. The berries, as described by several authors, seem to vary somewhat in color. European writers mention red berries, as do most American, in describing plants from the western portions of the continent[1] as well as from the eastern.[2] It is surprising, therefore, to find the words "berry white" used by Rydberg[3] and by Abrams[4] to distinguish *S. amplexifolius* from *S. curvipes*. Rydberg later[5] characterized this fruit as "scarlet, rarely white." Howell[6] described it as "yellow or red." In this connection, Dr. F. K. Butters wrote to me on April 10, 1933, "Please note the almost black berries on some of the Selkirk Mt. specimens. There are two forms there, one with orange-red berries, the other with crimson-black berries. They often grow together, and studying them in the field I never could discover any other differencies." A specimen from Glacier, British Columbia, collected by Dr. Butters and noted by him as being the black-berried form, seems in its other characters to belong with other plants of the western slopes and of the Lake Superior region; the middle-western plants, at least, ordinarily have red berries. The color of the fruit is not used in this treatment, but it is to be urged that collectors make notes on this character, which may yet prove to have some taxonomic significance.

There may be some variation in rootstocks; a few plants with fragments of underground parts suggest this. That these variations may be at least in part ecological in nature is suggested by specimens of *S. oreopolus* (which seems to be but an extreme phase of *S. amplexifolius*) found by the writer on Mt. Washington, New Hampshire. These grew in the water of a small stream above Tuckerman's Ravine, and had rootstocks so elongate that at least one internode measures 2.5 cm. in length.

The size of the flowers varies throughout a wide range, but with no apparent localization of forms except in northwestern Oregon, where there is a large-flowered extreme, and in Japan, where there is a small-flowered plant. Occasional specimens in both Europe and America

[1] Armstrong, Field Book of Western Wild Flowers 46 (1915). Coulter, Man. Bot. Rocky Mt. Region 347 (1885). Piper & Beattie, Fl. N. W. Coast 102 (1915). Jepson. Man. Fl. Pl. Calif. 248 (1923).

[2] Gray's Man., ed. 7: 292 (1908). Victorin, Contrib. Lab. Bot. Univ. Montréal xiv. 95 (1929). Britton & Brown, Ill. Fl., ed. 2: i. 520 (1913).

[3] Fl. Rocky Mts., ed. 2: 168 (1922).

[4] Ill. Fl. Pacific States i. 457 (1923).

[5] Fl. Prairies & Plains 220 (1932).

[6] Fl. N. W. Am. 658 (1903).

have the perianth-segments minutely papillate within, but this does not seem to correlate with anything else.

In the leaves are found definite characters, but they are so minute as to be almost invisible with an ordinary hand-lens. Throughout this study a binocular microscope was used, with a magnification of 17 or of 28.9 times. A piece of black paper or of blackened photographic film was cut one centimeter wide and inserted under the loose edge of a leaf to be studied. There then become visible on the margins of leaves of many plants minute teeth (PLATE 328, m & p). These are best developed on certain plants about the Pacific ocean and in the upper Great Lake region. They are completely lacking on the plants of the eastern slopes of the Rockies and of most of New England. Some plants of the western slopes of the Rockies (where the denticulate-leaved plants also occur), of the middle west, and of the more northern regions in the east, have occasional poorly developed teeth. These individuals thus grade into the other form, but in most cases the teeth are so sparse and minute that the plants are here treated with the entire-margined ones. To try to separate these varietally would end in absurdity, for it would mean going over every millimeter of leaf-margin to see if perhaps a single minute tooth might be found. In PLATE 328, FIG. o, one small tooth is shown on a leaf classified with the entire-margined group. Although it is impracticable to treat these with the western form, it is perhaps significant that these slightly denticulate leaves are on plants from the north, occurring in Greenland, Labrador, Newfoundland, the Mingan Islands, Anticosti, the Magdalen Islands, the Gaspé Peninsula, and in the northeastern states only on Mts. Katahdin, Washington, Mansfield, and Marcy. Even the plants of Europe have teeth on some of the leaves of every specimen seen by the writer, although the only mention of this character seems to have been made by Watson,[1] who wrote of the western American plant, "leaves . . . very rarely slightly scabrous on the margins."

A definite, if minute, variation occurs in certain plants of the Rocky Mountains, which seem to constitute an offshoot from the widespread entire-margined variety. In these, the lower surface of the leaves is covered with minute papillae (PLATE 328, l); these are readily seen under the magnifications mentioned above, especially if a slight ridge or depression in the leaf allows the light to fall nearly parallel to the surface. They are particularly well developed near the veins.

[1] Bot. Cal. ii. 178 (1880).

Some leaves do not show these papillae unless the source of light is placed very close to the surface, when they become clearly visible. None of the papillate-leaved plants have any trace of marginal teeth; none of the denticulate-leaved plants ever have any papillae.

It is not possible to separate the American plants specifically from the European, but strong tendencies are shown in two sets of characters. The European plants have in general longer pedicels (*i. e.*, the part between the flower and the twist or bracted point) than the American, as was noted many years ago,[1] and are usually provided with a greater number of sterile leaves on each branch distal to those associated with the flowers. While there is sometimes overlapping in these characters, particularly in the Rocky Mountains, where rarely occur long-pedicelled individuals approaching the European variety, they seem in combination sufficient to justify varietal separation.

S. AMPLEXIFOLIUS, var. **genuinus**. *Uvularia amplexifolia* L. Sp. Pl. i. 304 (1753).—Mountainous regions of southern Europe.

S. AMPLEXIFOLIUS, var. **chalazatus**, n. var., var. *americanum* simulans; foliis sine dentibus, subtus cum copiosis minutis papillis. (PLATE 328, FIG. 1).—Southern British Columbia and Washington to

Map 1. Ranges of STREPTOPUS AMPLEXIFOLIUS, var. CHALAZATUS (dots) and var. AMERICANUS (circles).

South Dakota and southern Utah and New Mexico (MAP 1, dots). TYPE in Herbarium of the University of Wisconsin: Wallowa Lake, Oregon, June 15, 1933, *H. P. Hansen*, no. 1100.

[1] Don, Trans. Linn. Soc. xviii. 529 (1841).

S. AMPLEXIFOLIUS, var. AMERICANUS Schultes, Syst. Veg. vii. 311 (1829). *S. distortus* Michx. Fl. Bor.-Am. i. 200 (1803). (PLATE 328, FIG. o.)—Greenland to New England and northern New York, and to North Carolina in the mountains; rarely about the northern Great Lakes region where it grades into the next; Alaska to Washington, and in the mountains to Arizona and New Mexico (MAP 1, circles). Where this range overlaps that of var. *chalazatus*, the two plants apparently may occur together.

This also occurs in Kamchatka. Dr. Eric Hultén, who has been kind enough to examine his collections from that region, finds one of var. *americanus*, four distinctly var. *denticulatus*, and five intermediate. He also writes me that all material from the Aleutian Islands is clearly var. *denticulatus*, as is most of that from other parts of Alaska.

S. AMPLEXIFOLIUS, var. **denticulatus**, n. var., var. *americanum* simulans; foliorum marginibus cum minutis dentibus 10–25 per cm. (PLATE 328, FIGS. m, p & r).—About Lake Superior and the northern

Map 2. Ranges of STREPTOPUS AMPLEXIFOLIUS, var. DENTICULATUS (dots), var. GRANDIFLORUS (crosses) and var. OREOPOLUS (circles).

end of Lake Michigan; Aleutian Islands to northern California; Amur; Kamchatka. (MAP 2, dots). TYPE in Herbarium of the University of Wisconsin: wet wooded gully, Mellen, Wisconsin, June 7, 1934, *N. C. Fassett & Julius Popko*, no. 16716.

To the list of plants of the Pacific slopes of the continent which reappear about Lake Superior may be added *S. amplexifolius* var. *denticulatus*. Indeed, the combined range of this and the next variety bears a very close resemblence to that of the Devil's Club,[1] except that the latter has a much more restricted range in the middle west.

S. AMPLEXIFOLIUS, var. PAPILLATUS Ohwi, Tokyo Bot. Mag. xlv. 185 (1931).

The original description reads, "Caulis inferne papillis longis sparse

[1] See Fernald, Mem. Am. Acad. of Arts & Sci. xv. 257, map 22 (1925).

obsitus," indicating that its author was describing plants which develop a coarse pubescence toward the base of the stem. Such plants may occur anywhere throughout the range of *S. amplexifolius*. If the plant of Japan is recognized as a variety distinct from those of Europe and most of North America, the inappropriate name *papillatus* must be applied to it, and the variety redefined as follows: Leaves minutely denticulate, green both sides; perianth-segments 7–9 mm. long, with a spread of from 7–9 mm. In var. *americanus* small flowers are sometimes found, but with one exception the only denticulate-leaved plants with small flowers are from Japan. The exception is from shaded woods, Hoonah, Alaska, June 7, 1915, *Mr. & Mrs. E. P. Walker*, no. 683 (Gray). This specimen should probably be considered as var. *papillatus*, although the leaves are somewhat whitened beneath. Another specimen, no. 679, of the same habitat, locality, date, and collectors, is typical var. *denticulatus*.

S. AMPLEXIFOLIUS, var. **grandiflorus**, n. var., var. *denticulatum* simulans, sed foliis longioris latioribusque; floribus 13–17 mm. longis, 13–26 mm. extendentibus.—Western Oregon (MAP 2, crosses): wet rocks, Falls City, May 12, 1917, *J. C. Nelson*, no. 1143 (TYPE in Gray Herbarium); rocky banks of Wilson's River, 15 miles above Tillamook, April 21, 1928, *J. W. Thompson*, no. 4114 (Gray); rocky banks of Santian River, near Mehana, Marion County, May 9, 1928, *Thompson*, no. 4170 (Gray; U. S.); Wimer, May 26, 1892, *E. W. Hammond*, no. 391 (N. Y.; U. S.).

S. AMPLEXIFOLIUS, var. **oreopolus** (Fernald), n. comb. *S. oreopolus* Fernald, RHODORA viii. 70 (1906). (PLATE 328, FIG. q).—Newfoundland; Mingan Islands and Gaspé and Matane Counties, Quebec; Mt. Katahdin, Maine; Mt. Washington, New Hampshire (MAP 2, circles).

While this plant stands out as strikingly distinct from the *S. amplexifolius* var. *americanus* of northeastern America, a study of other varieties of *S. amplexifolius* throws doubt on the specific validity of *S. oreopolus*. Its leaves are copiously ciliate, thus differing from those of the representative of *S. amplexifolius* common in the region, but the western *S. amplexifolius* var. *denticulatus* approaches it in this character; PLATE 328, FIG. r, shows the leaf-margin of a plant from Oregon, which, had it been collected in the region where *S. oreopolus* is found, would certainly have been treated with it. *S. oreopolus* often has ciliate pedicels and peduncles, but they may be glabrous as in other varieties of *S. amplexifolius*. The perianth-segments of *S. oreopolus* are always copiously papillate within; while the other varieties of *S. amplexifolius* often lack this character, occasional specimens show well-developed papillae. The dark red flowers of *S.*

orcopolus differ conspicuously from the whitish or greenish ones of its neighbor, *S. amplexifolius* var. *americanus*, but for the flowers of the European plant we find such descriptions as "weiss, aussen rötlich oder grünlich,"[1] or "aussen grünlich-gelb, innen weiss mit röthlichem Anflug,"[2] or "white, with a reddish tinge."[3] Turning to illustrations of the European plant, we find that, while some show white[3,4] or yellow[5] perianths, others[6] indicate a pinkish tinge, or even deep red[2,7] toward the base. While most authors describe the flower of the western American plants as white or greenish,[8] others[9] include the term "or purplish" in the description. Concerning the plant

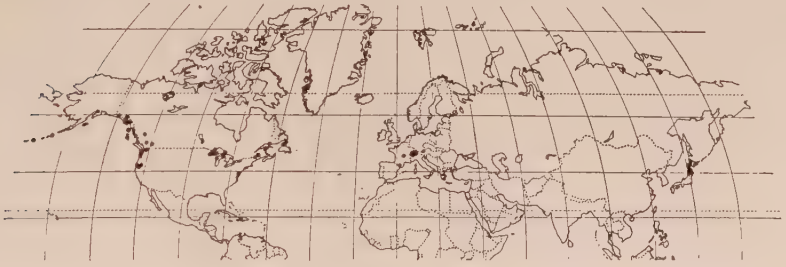
Map 3. Ranges of Streptopus roseus, var. typicus (crosses), var. perspectus (circles), var. longipes (dots) and var. curvipes (x's).

of eastern Asia we find "flores sordide rosei"[10] and "flowers white, shaded rose-purple."[11] A specimen from Tillamook County, Oregon (June 25, 1894, *F. E. Lloyd*, in New York Botanical Garden) bears the

[1] Hegi, Ill. Fl. Mitt.-Eu. ii. 268 (1909).
[2] Schlechtendal, Lang & Schenk, Fl. Deutschl. ed. 5, iv. 13 (1880).
[3] Seboth & Bennett, Alp. Pl. iii. 51 (1880).
[4] Hartinger, Atlas Alpenfl. 450 (1884).
[5] Redouté, Liliac. v. t. 259 (1819).
[6] Peterman, Deutsch. Fl. 570, t. 89, fig. 702 (1894).
[7] Reichenbach, Ic. Fl. Germ. x. t. 431 (1848).
[8] Watson, Bot. Cal. ii. 178 (1880); Howell, Fl. N.-W. Am. i. 658 (1903); Frye & Rigg, Northwest Flora 109 (1912); Piper, Fl. Wash., in Contrib. U. S. Nat. Herb. xi. 201 (1906); Gilkey, Spring Flora of Northwestern Oregon 9 (1929).
[9] Coult. & Nelson, Man. Bot. Central Rocky Mts. 119 (1909); Clements & Clements, Rocky Mt. Flowers 310 (1914).
[10] Maxim., Primit. Fl. Amur. 274 (1859).
[11] Diels, Pl. Chin. Forrest. 272 (1912).

annotation "perianth red," and a sheet from Mt. Selwyn, British Columbia (*Raup & Abbe*, no. 4178, in the Gray Herbarium) clearly shows pink flowers. The type collection of *S. amplexifolius* var. *denticulatus* has the perianth-segments flecked with deep pink within.

It is perhaps significant that *S. amplexifolius* var. *oreopolus*, so distinct from the wide-ranging var. *americanus*, and occupying an area known to have many species of ancient distribution,[1] should approach on the one hand *S. amplexifolius* var. *genuinus* of southern Europe but not the more northern extensively glaciated portions of that continent, and on the other hand vars. *denticulatus* and *papillatus*, whose combined ranges almost coincide with that of the Devil's Club. Map 4 shows the disrupted ranges of this plant and its allied varieties:



Map 4. Ranges of Streptopus amplexifolius, var. genuinus (so. Europe), var. oreopolus (e. North America), var. denticulatus (Great Lakes reg., w. North America and Kamchatka) and var. papillatus (Japan).

in Europe, *S. amplexifolius* var. *genuinus;* in eastern North America, var. *oreopolus;* in the Great Lakes region, western North America, and Kamchatka, var. *denticulatus;* in Japan, var. *papillatus*.

It has been suggested that *S. oreopolus* may be a hybrid of *S. amplexifolius* [var. *americanus*] and *S. roseus*.[2] Victorin[3] points out that a cross of two plants, one with a flower practically white and the other with rose-colored flowers, would scarcely be expected to have a dark red perianth. To this may be added the observation that *S. oreopolus* has the perianth-segments conspicuously papillate within, while *S. amplexifolius* var. *americanus* rarely has well-developed papillae, and the representative of *S. roseus* occurring in that region lacks papillae of the type found in the purported hybrid. Furthermore, if *S. amplexifolius* and *S. roseus* can hybridize, why do they

[1] See Fernald, Mem. Am. Acad. of Arts & Sci. xv. no. III (1925).
[2] Fernald, Rhodora ix. 107 (1907).
[3] Contrib. Lab. de Bot. Univ. de Montréal xiv. 21 (1929).

not do so in the many other places where their ranges overlap, instead of only in one limited region? In short, when we consider the floral morphology of *S. oreopolus*, and its apparently close relationship to the western forms of *S. amplexifolius*, keeping in mind the numerous other plants of the Gulf of St. Lawrence region which also show relationship to western forms, it seems less likely that it is a hybrid of local origin than that it is a relic, closely allied to certain varieties of *S. amplexifolius*, which are found in remote regions.

On Mount Washington, New Hampshire, just above Tuckerman's Ravine, may be found a most interesting series of variations of *S. amplexifolius*. Var. *oreopolus* is abundant, and var. *americanus* can also be found. A third type of plant has denticulate leaves like those of var. *denticulatus*. Since its leaf-margin is intermediate between that of var. *americanus* and that of var. *oreopolus*, and, in addition, the lower leaf-surface is less glaucous than in the former, but more so than in the latter, it is considered as a hybrid of these two varieties. The flowers, which were just beginning to open when observed by the writer on June 27, 1934, were nearly white and conspicuously papillate within. Perhaps some New England amateur will find it possible to study these variations throughout a season. The expanded flowers should be observed, especially for correlation of perianth-color with degree of toothing on the leaf-margin, and the fruit-colors should be noted.

4. S. **obtusatus**, n. sp., planta glabra; foliis amplexicaulibus, marginibus ciliatus; perianthiis campanulatis, segmentis obtusis; antheris filamentibus subaequalibus, basi cordatis, triangularibus, apicibus bifidis; stigmatibus 3-lobis 2/3 ad basem; baccis rubris. (Plate 328, fig. e.)—Szechwan, China: Baurong to Tachienlu, via Hadjaha, alt. 9000–15500 ft., May–June, 1929, *Herbert Stevens*, no. 422 (type in Herb. Field Museum); Tachienlu to Sachou, via Mouping, alt. 9200–12200 ft., August–September, 1929, *Stevens*, no. 80 (Field). The following probably belongs here: western Szechuan, *E. H. Wilson*, no. 4663 (Gray).

While the leaves of this species are very similar to those of *S. amplexifolius*, the floral characters place it unquestionably as a close relative of *S. roseus*. *S. roseus* and *S. obtusatus*, then, stand out as one more pair of closely related but very distinct species, one appearing in North America, and the other in Asia.

Fruiting specimens may be mistaken for *S. amplexifolius*, from which they may be distinguished by their uppermost leaves, which are not cordate and are somewhat oblique at base, rather than clasping and essentially equal at base as in *S. amplexifolius*. The leaf-margins

have 28–40 teeth per centimeter, more than are found in any form of *S. amplexifolius* except var. *oreopolus*.

5. S. ROSEUS Michx. Fl. Bor.-Am. i. 201 (1803).

The fact that all Wisconsin specimens identified as *S. roseus* which show underground parts have long rootstocks, the character of *S. longipes*, has led to a consideration of other possible distinctions between these two so-called species. Such characters have been sought in rootstocks, branching of stem, ciliation of leaves, the peduncles and pedicels, perianth, pistil and stamens, and fruit and seeds. *S. longipes* appears to be intermediate between *S. roseus* and the western *S. curvipes* and the writer is led reluctantly to the conclusion that these three plants intergrade to such an extent that they cannot be maintained as species.

ROOTSTOCKS. It was because of its slender and wide-creeping rootstock that *S. longipes* was first separated from *S. roseus*. F. C. Gates, studying the plants in the field in northern Michigan (Lower Peninsula) states[1] that the "length, thickness, branching and abundance of roots varied to both extremes with the variation in the character of the soil from good hardwood to pine land soil." While driving from Thessalon, Ontario, through Sault Ste. Marie and into the Upper Peninsula of Michigan, on September 11, 1932, the present writer had opportunity to observe the behavior of rootstocks in a region where the ranges of *S. roseus* and *S. longipes* overlap (see MAP 3). PLATE 328, FIG. a, shows a rootstock from this region which is of the *S. roseus* type; this is a close match for specimens collected by the writer in Maine. FIG. b shows another rootstock from the same region; this is clearly the *S. longipes* type, found from Michigan westward. But the identity of the plant shown in FIG. c is not so obvious, although some other plants in the same colony were much more like *S. longipes*. FIG. d illustrates another type of intermediate, in which the rootstock has been of a *roseus* type for some years, but is abruptly taking on the character of *S. longipes*. It may be noted here that in the Flora of the State of Washington *S. curvipes* is reduced outright to *S. roseus*, with the comment, "The western form of this species is commonly smaller than that of the eastern States, and shows a tendency to produce longer rhizomes, but we believe these differences are not specific, especially as rhizomatous forms occur also in the Allegheny Mountains."[2] We may conclude, then, that the plant of the middle west has

[1] RHODORA xiii. 237 (1911).

[2] Piper, Contrib. U. S. Nat. Herb. xi. 202 (1906). No plants with elongate rootstocks were found among the specimens from the Alleghenies examined in the present study.

a strong tendency to produce longer rootstocks than does the plant of the east, and whether or not this warrants specific recognition must be considered with its relation to other differences.

Branching of Stems. Here we find strong tendencies, but none sufficient for specific differentiation. *S. roseus* is usually branched, *S. longipes* often branched, and *S. curvipes* rarely branched. Dr. Butters writes me from Minnesota: "Of the specimens at hand 95% of the *curvipes* is unbranched, 54% of the *longipes*, and only 20% of true *roseus*." The following data, approximating those of Dr. Butters, were derived from the material in the herbaria of the University of Wisconsin, the New York Botanical Garden, the United States National Museum, and the University of Montreal.

	S. roseus, 196 plants.	S. longipes, 74 plants.	S. curvipes, 91 plants.
Simple	13%	62%	96%
2-branched	31%	16%	4%
3-branched	39%	15%	
4-branched	15%	6%	
5-branched	1%	1%	
6-branched	1%		

These figures may be compared with those taken in single patches in the field. On July 2, 1933, a count was made on *S. roseus* about the Lake of the Clouds, on Mount Washington, New Hampshire. Again, 100 individuals of *S. roseus* were examined in pine woods at Whitefield, Maine, on August 3, 1933. *S. longipes* was studied in the Barron Hills, Rusk County, Wisconsin, where 100 plants were observed. The results may be compared in a table. In all cases only flowering individuals were counted.

	S. roseus Mt. Washington, N. H.	S. roseus Whitefield, Maine.	S. longipes. Barron Hills, Wisconsin.
Simple	18	11	52
2-branched	50	45	38
3-branched	30	32	9
4-branched	2	8	1
5-branched		3	
6-branched		1	

So, as was expected from the study of herbarium material, the individuals of *S. roseus* in woods at low altitudes proved to have a tendency to branch more than those in the alpine regions of Mt. Washington, but even the latter were more freely branching than those of *S. longipes* growing in the woods.

Ciliation of Leaves. Here we find strong tendencies, but no clear-cut distinctions. In *S. roseus* the number of cilia per centimeter varies from 30 to 50, but on occasional plants they may run as low as 22 or as high as 60 per centimeter. The best way to observe this is with a binoccular microscope, a strip of black paper one centimeter wide being inserted under a loose leaf-edge. In *S. longipes* there are rarely more than 30 cilia per centimeter, although on a few plants, otherwise characteristic, they reach 38 per centimeter, or even 60 per centimeter in some; they may be as sparse as 14 per centimeter. The average number in *S. roseus* is about 34, and in *S. longipes* about 25.

In *S. curvipes* they are usually less abundant. The length of the cilia, while so variable as to have little diagnostic value, is seldom over 0.3 mm. in *S. roseus*, and often reaches 0.4 or 0.5 mm. in *S. longipes*. In *S. curvipes* they are usually much shorter than in *S. roseus*.

Peduncles and Pedicels. These are very variable, their combined length being sometimes as little as 5 or 6 mm. in all the species, but the upper limit of variation is much less in *S. curvipes* than in the others.

Perianth. In the venation of the perianth-segments seems to lie one of the most satisfactory distinctions between the so-called species. In *S. roseus* the sepals are 9–11-nerved (rarely only 7-nerved) and the petals are 7-nerved, while in *S. longipes* and *S. curvipes* the sepals are 5–7-nerved and the petals are 3–5-nerved. But occasional exceptions may be found, when plants otherwise agreeing with *S. longipes* have 9-nerved sepals. Also, if flowers of *S. longipes* are boiled and observed with transmitted light, many small branch-nerves appear; thus, a petal from a plant collected by the writer at Merrimac, Wisconsin, is when dry distinctly 5-nerved, but after boiling it shows with transmitted light eleven nerves of varying lengths.

Another perianth character has been called to my attention by Dr. Butters. In *S. longipes* and *S. curvipes* the inner surface of the perianth-segments almost always has copious short papilla-like hairs (plate 328, fig. k), longer in *S. curvipes* than in *S. longipes*. These are rarely developed in *S. roseus*, which sometimes has what appear to be, in dried flowers, appressed or elongate very fine hairs. Under the microscope these appear as long low papillae (plate 328, fig, j). But a series of specimens collected by the writer in Rusk County, Wisconsin, while having characteristic *longipes* rootstocks, have the many-veined and non-papillate perianth-segments of *S. roseus*, and numerous

other exceptions have been noted on several herbarium sheets. Professor Butters has also pointed out to me that the stamens of *S. longipes* are usually 3/5 to 2/3 the length of the perianth-segments, while those of *S. roseus* are ordinarily only about ½ the length of the perianth-segments; however, the number of exceptions is so great as to destroy the value of this as a really diagnostic character.

Pistils and Stamens. Here, Dr. Butters has pointed out to me two tendencies. The bases of the filaments, which are in all cases fused with the perianth, are in *S. roseus* often fused with each other, and are less often so in *S. longipes*. Well developed stigmas are usually more widely spreading in *S. longipes* than in *S. roseus*.

Fruit and Seeds. The seeds are, as far as the writer can determine, identical in *S. roseus*, *S. longipes*, and *S. curvipes*. As for the fruits, Gates distinguishes *S. longipes*, with berry subglobose in general shape and triangular in cross-section with very obtuse angles, from *S. roseus*, with more or less globose fruit which is circular in cross-section.[1] It is, of course, impossible to tell from pressed specimens how generally this holds. The writer has berries preserved in alcohol, representing the following collections: *S. longipes:* Parfrey's Glen, Merrimac, Wisconsin, July 16, 1932, *N. C. Fassett*, no. 14381; same location, July 24, 1932, no. 14382. *S. roseus:* Ocean Point, Maine, July 28, 1932, *Mrs. L. J. Fassett & Ellen Denike;* Ocean Point, Maine, August 4, 1932, *Josephine W. Chute;* White Island, Boothbay, Maine, July, 1933, *J. H. Fassett;* Garden River, Ontario, August 20, 1932, *N. C. Fassett*, no. 14700. In all of these the berries are triangular in cross-section when young, becoming more turgid as they mature; those of *S. roseus* appear to be more turgid than those of *S. longipes*. There should be more observation of this character in the field, and more herbarium specimens should be accompanied by preserved fruits.

S. longipes, then, resembles *S. roseus* in the length of cilia on the leaves; it is intermediate between *S. roseus* and *S. curvipes* in branching and the amount of ciliation on the leaves; and it resembles *S. curvipes* in the rootstock and the perianth. In view of these facts, these plants seem best treated as three geographic varieties of one species.

Since the categories in which we place plants are to a great extent but human conceptions and rest on individual opinions, I may be pardoned if I introduce some personal experiences. In the summer of

[1] Rhodora xiii. 237 (1911).

1931 I studied this group in the Gray Herbarium, and came to the conclusion that *S. roseus* and *S. longipes* were two perfectly distinct species, separable on a number of characters, and with ranges that did not overlap. Later, a study of more ample material from the middle west convinced me that this idea was incorrect. In 1911 Professor F. C. Gates wrote as follows: "Accordingly *Streptopus longipes* has demonstrated its specific validity and to its description should be added the words: fruit subglobose, trigonous in cross-section with obtuse angles."[1] On December 12, 1932, Professor Gates wrote to me as follows: "In reply to your letter regarding *Streptopus longipes:* in the early days of the station [at Douglas Lake, Cheboygan County, Michigan], *Streptopus* was present in many of the beech-maple forests. We found specimens which had the root character what Fernald used in describing *Streptopus longipes* together with the trigonous fruit character. We found other plants which had an entirely different root character with globose fruits. In those days, we considered the one with trigonous fruit as *Streptopus longipes* as the root character usually, but not always, agreed with that. As time has gone on, the forests have been lumbered and at present there are not sufficient data in the Douglas Lake region to give one any satisfaction regarding what is what. We have felt that if the two are separate species, they have hybridized and succeeding generations have broken up in different ways, which would explain the differences in combination of these two characters. As I have not had any opportunity to study *Streptopus* except in the Douglas Lake region, I really cannot answer your question at the present time. It could, of course, be that farther west, one is present without the other, and it could be that there is only one species which varies under different conditions. At the Biological Station of late years, we have been inclined more toward the latter explanation than the former, but as I said before, will have to admit that the widespread destruction of the forests has resulted in the dying off of *Streptopus* and we find insufficient data to settle the question."

It is a pleasure to acknowledge the coöperation of Professor F. K. Butters, who has pointed out a number of distinctions between *S. roseus* and *S. longipes*, as has already been mentioned. Like the present writer, he at first considered that they were very distinct species, but on February 1, 1933, after we had both made a thorough study of the material in the herbaria of the University of Minnesota

[1] Rhodora xiii. 237 (1911).

and of the University of Wisconsin, Dr. Butters wrote me as follows: "Now as to the taxonomy of the two forms, it seems to me that they are just about on the border line between species and varieties. . . I am not much worried about the undoubted intermediates that occur in Michigan. It seems to me that these are best explained as the result of recent hybridity between the two entities, where their gradually extending ranges have overlapped. I don't think such intergrades occurring in a limited district are sufficient in themselves to reduce the intergrading forms to the status of varieties rather than species. More troublesome is the fluctuating and apparently unfixed condition of most of the characters. All things considered I am inclined to think your disposition of them is best. Of course, whatever you do with *S. longipes* will have to be done also with *S. curvipes*. Those two forms are very closely related, I think more closely than either is related to true *S. roseus*. . . . Isn't this another case of the relationship of plants of the general Lake Superior region with those of the northern Cordillera?"

In the preceding paragraphs, the names *S. roseus*, *S. longipes*, and *S. curvipes*, have been used for the common plants of the eastern states, the middle west, and the far west, respectively. In the seventh edition of Gray's Manual the range of *S. longipes* is limited to one county in Upper Michigan; this is too restricted, for it occurs in Minnesota, Wisconsin and much of Michigan, to the exclusion of *S. roseus*.

A fourth phase of this group occurs in the southern Alleghenies, where many of the plants have perfectly glabrous peduncles and pedicels (flower stalks, if not branching, usually bear near the middle a little callus; the part above this callus is considered to be pedicel, and below it peduncle). The habitat of *S. roseus* as given by Michaux ("in excelsis montibus Carolinae septentrionalis et in Canada") suggests that the type of the species may be the glabrous-peduncled plant. This possibility is heightened by Michaux's plate illustrating this species, for a plant with glabrous pedicels and peduncles is shown. However, this plate is so inaccurate, showing no ciliation on the leaves, and twisted flower-stalks like those of *S. amplexifolius*, that it seems best to leave it out of consideration. An illustration of a little later date[1] also shows glabrous flower-stalks, with ciliate leaves.

The question of the identity of the plant of Michaux is solved by a letter to the writer from M. François Pellegrin, in which he says:

[1] Lodd. Bot. Cab. xvii. t. 1603 (1830).

"l'échantillon de *Streptopus ciliatus*[1] de l'herbier Michaux a les péduncules et pédicelles entièrement glabres." The local plant of the southern mountains must, then, be taken up as type, and the more wide-spread phase taken up as a new variety.

S. ROSEUS Michx., var. **typicus**. *S. roseus* Michx. Fl. Bor.-Am. i. 201 (1803), excluding reference to Canadian plant. PLATE 328, FIGS. g & i; MAP 3, crosses.—VIRGINIA: south slope of White-top Mt., May 28, 1892, *E. W. Cathcart* (U. S.); summit of White-top Mt., Washington County, May 28, 1892, *N. L. & E. G. Britton & Anna M. Vail* (N. Y.); northeast slope of White-top Mt., Smythe County, May 28–29, 1892 (Field). NORTH CAROLINA: Grandfather's Mountain, altitude 5000–5800 ft., July 10–12, 1925, *P. A. Rydberg*, no. 9342 (N. Y.); Roan Mountain, June, 1878, *M. E. Hyams* (N. Y.); Roan Mountain, June, 1879, *A. Gray, C. S. Sargent, J. H. Redfield & W. M. Canby* (Gray). The following specimens are intermediate between this and the next variety: PENNSYLVANIA: Conashaugh, July 6, 1890, *N. L. Britton* (N. Y.). VIRGINIA: north-east slope of White-top Mountain, Smythe County, altitude 4000–5000 ft., May 28–29, 1892, *J. K. Small* (U. S.; Field). NORTH CAROLINA: Richland Balsam Mt., Haywood County, 5000 ft. altitude, May 21, 1911, *H. D. House*, no. 4574 (U. S.); Roan Mountain, 1894, *Dr. H. A. Edson* (U. S.); summit, 6300 ft., Roan Mountain, July 15, 1880, *John Donnell Smith* (U. S.); along streams on northern slopes of Craggy Mountain, Buncombe County, May 25, 1897, *Biltmore Herbarium*, no. 4665 (U. S.; N. Y.); along mountain streams near Highlands, Macon County, May 24, 1897, *Biltmore Herbarium*, no. 4665b (N. Y.); high mountains of North Carolina, June, 1868, *Wm. M. Canby* (U. S.); ravines, 3500 ft. altitude, "Pink Beds," Pisgah Forest, Transylvania County, May 8, 1909, *H. D. House*, no. 4142 (U. S.).

The line between var. *typicus* and var. *perspectus* is drawn at perfectly glabrous pedicels rather than to include in the former variety those plants with much reduced ciliation because such nearly glabrous ones are occasionally found throughout the range of var. *perspectus*, while completely glabrous ones seem to be confined to the southern mountains.

Among the tendencies shown by individuals of *Streptopus roseus* from the southern Alleghenies is a lack of cross-veins in the leaves in many plants. But since this is not universal in the region, and is occasionally found in other parts of the range of *S. roseus*, it is here recognized with no more than this note.

S. ROSEUS, var. **perspectus**, n. var., rhizomate cum internodiis curtissimis (PLATE 328, FIG. a); pedunculis pedicellisque ciliatis (FIGS. f.

[1] The type specimen, in the herbarium of Michaux, is marked *Streptopus ciliatus; roseus* has been written on the label by another's hand. See Victorin, Contrib. du Lab. de Bot. de l'Univ. de Montréal xiv. 24 (1929).

& h); sepalis (7–) 9–11-nervis; sepalis petalisque intra non papillatis (FIG. f).—Southern Labrador, Newfoundland, and Quebec to northern New Jersey and western Pennsylvania, southward in the mountains to Virginia, Tennesee, and North Carolina (where it intergrades with the preceding), Georgia (according to Chapman), westward through southern Ontario to central Michigan and the eastern extreme of the Upper Peninsula of Michigan, where it intergrades with var. *longipes*. (MAP 3, circles).—TYPE in the Herbarium of the University of Wisconsin: under trees, floor of Tuckerman's Ravine, Mt. Washington, New Hampshire, June 27, 1934, *N. C. Fassett*, no. 16422.

S. ROSEUS, var. PERSPECTUS, f. **giganteus**, n. f., caulis crassus; sepalis 10–12 mm. longis; staminibus 5–7 mm. longis; aristis antherarum 0.5–1.0 mm. longis; stigmatibus 1.1 mm. longis.—Talus de l'escarpment, avec *S. amplexifolius* & *S. oreopolus*, Ile Nue, Archipel de Mingan, Québec, 28 juillet 1926, *Victorin & Rolland*, no. 24336 (TYPE in the Herbarium of the University of Montreal).

This collection is unique among those studied by the writer, in that the stems are a centimeter thick (when pressed) below the first branching, and the floral parts are much larger than those of the ordinary plants. It appears to be a polyploid of the nature of *Oenothera gigas*. There are two sheets in the herbarium of the University of Montreal, and one in that of the University of Wisconsin, bearing this number; all are f. *giganteus*, while other collections from the same locality bear flowers of normal size.

S. ROSEUS, var. **longipes** (Fernald), n. comb. *S. longipes* Fernald, RHODORA viii. 71 (1906).—Southern Ontario, northwestern Pennsylvania,[1] northern Michigan and Wisconsin to western Minnesota and southern Manitoba (MAP 3, small dots).

S. ROSEUS, var. **curvipes** (Vail), n. comb. *S. curvipes* Vail, Bull. Torr. Bot. Cl. xxviii. 267 (1901). *S. roseus* Piper, Contrib. U. S. Nat. Herb. xi. 202 (1906). *S. brevipes* Fernald, RHODORA viii. 69 (1906), not Baker. (PLATE 328 FIG. k).—Alaska to southeastern British Columbia and northern Oregon (MAP 3, x's).

6. S. STREPTOPOIDES (Ledeb.) Frye & Rigg, Northwest Flora 109 (1912). *Smilacina streptopoides* Ledeb. Fl. Ross. iv. 128 (1853). *Kruhsea Tilingii* Regel ex Regel & Tiling, Fl. Ajanensis 122 (1858). *Streptopus ajanensis* Tiling ex Regel & Tiling, l. c. (*nomen nudum*).

Within the eastern Asiatic and western North American *S. streptopoides* we find a series of variations very similar to those within *S. roseus*. The following treatment must be considered as provisional; the final understanding of the Asiatic plants must rest upon a study of a large series of specimens and upon field observation.

S. STREPTOPOIDES, var. **verus**. *Smilacina streptopoides* Ledeb. l. c.

[1] Specimens seen at Carnegie Museum since MAP 3 was engraved.

Specimens seen: SIBERIA: Ayan, Ochotsk Sea, *C. Wright* in 1853–56 (Gray, U. S.); Ayan, *Tiling* (Gray).

S. STREPTOPOIDES, var. **brevipes** (Baker), n. comb. *S. ? brevipes* Baker, Journ. Linn. Soc. xiv. 592 (1875). *Kruhsea Tilingii* Baker, l. c., 593 in part. *K. Tilingiana* Farr, Contrib. Bot. Lab. Univ. Pa. ii. 417 (1904).—Alaska to Washington, east to Idaho and southeastern British Columbia.

PLATE 328, FIG. n, shows the characteristic rounded hyaline cells of the leaf-margin. While considerable magnification is required to see this, it is quite unmistakable and does not occur elsewhere in the genus.

The name *S. brevipes* has sometimes been applied to *S. roseus* var. var. *curvipes;* a specimen in the Gray Herbarium, Cascade Mts., 49 N. Lat., 1859, *Dr. Lyall,* appears to be the type, and while it is in fruit, its leaf character places it unquestionably with *S. streptopoides.*

S. STREPTOPOIDES, var. **japonicus** (Maxim.), n. comb. *S. ajanensis,* var. *japonica* Maxim. Mel. Biol. xi. 856 (1883); Matsumura, Ind. Pl. Jap. 214 (1905). *S. japonicus* Ohwi, Tokyo Bot. Mag. xlv. 189 (1931). *S. streptopoides* Matsum. Ic. Pl. Koisikav. i, pl. 54 (1912), which represents the larger forking plant without long rootstocks.—Northern Japan and Yezo.

S. STREPTOPOIDES, var. ATROCARPUS Matsum. l. c., p. 107. *S. japonicus,* var. *atrocarpa* Ohwi, Tokyo Bot. Mag. xlv. 189 (1931).

The relation of this to var. *japonicus* could not be determined from the material at hand. All the Japanese specimens of *S. streptopoides* studied were of the stout branched type; some had a long rootstock like that shown in PLATE 328, FIG. b, while others had a short rootstock like that in FIG. a. The color of the berry was not distinguishable.

7. S. KOREANUS (Komarov) Ohwi, Tokyo Bot. Mag. xlv. 189 (1931). *S. ajanensis,* var. *Koreana* Komarov, Fl. Mansh. i. 476 (1901); Nakai, Fl. Koreana ii. 246 (1911).—Specimen studied: flum. Jumin-gan, Korea septentrionalis, July 13, 1897 (styl. vet.), *V. Komarov,* no. 407 (Gray; N. Y.).

KEYS FOR LOCAL USE

A few keys are here presented which may be of use in identifying specimens from various parts of North America.

For the area from Labrador and western Quebec southward:

a. Nodes glabrous; leaves clasping at base; fruit elongate; perianth-segments widely spreading or recurved *b*
b. Leaves whitened beneath, their margins entire or essentially so; peduncles and pedicels always glabrous; perianth greenish white; fruit scarlet.....*S. amplexifolius* var. *americanus.*
b. Leaves green beneath, their margins denticulate to ciliate; peduncles and pedicels often ciliate; perianth deep red; fruit cherry-red.....*S. amplexifolius* var. *oreopolus.*

a. Nodes fringed; leaves not clasping; fruit globose; perianth-segments not recurved *c*
c. Pedicels, and often the peduncles, glabrous....*S. roseus* var. *typicus.*
c. Pedicels and peduncles ciliate *d*
d. Stem rarely more than 5 mm. thick at the first branching; perianth 6–10 mm. long.....*S. roseus* var. *perspectus.*
d. Stem 1 cm. or more thick at the first branching; perianth 10–12 mm. long.....*S. roseus* var. *perspectus* f. *giganteus.*

For Ontario, Manitoba, Michigan, Wisconsin and Minnesota:

a. Nodes glabrous; leaves clasping at base, their margins entire or minutely denticulate; perianth-segments widely spreading or recurved *b*
b. Leaf-margins entire or with fewer than 10 teeth per centimeter.....*S. amplexifolius* var. *americanus.*
b. Leaf-margins with 10–25 teeth per centimeter. *S. amplexifolius* var. *denticulatus.*
a. Nodes fringed; leaves not clasping, their margins copiously ciliate; perianth-segments not recurved except at tip *c*
c. Rootstock with crowded nodes; leaf-margins with usually more than 30 cilia per centimeter; sepals (7–)9–11-nerved, not papillate within.....*S. roseus* var. *perspectus.*
c. Rootstocks with internodes several centimeters in length; leaf-margins with usually less than 30 cilia per centimeter; sepals 3–5-nerved, minutely papillate within. *S. roseus* var. *longipes.*

In the area from Montana to New Mexico, west to the continental divide and east to South Dakota, will be found only *S. amplexifolius*, occurring as two varieties: var. *chalazatus* has the leaves minutely papillate beneath, while var. *americanus* does not. The writer is not familiar with these in the field, but from a study of herbarium material it appears that they may grow together. Observers in this region may discover some differences in habit, fruit or habitat.

For the west slopes of the Rockies to the Pacific coast:

a. Large usually branching plants often reaching a meter in height; nodes glabrous; perianth-segments spreading from about the middle *b*
b. Leaf-margins entire or with not more than 10 minute teeth per centimeter *c*
c. Leaves papillate beneath.....*S. amplexifolius* var. *chalazatus.*
c. Leaves not papillate beneath.....*S. amplexifolius* var. *americanus.*
b. Leaf-margins with 10 or more teeth per centimeter. *S. amplexifolius* var. *denticulatus.*
(Vars. *grandiflorus* and *papillatus* occur locally)
a. Small rarely branching plants seldom more than 3 dm. high; nodes fringed; perianth campanulate or rotate *d*
d. Perianth campanulate; leaf-margins with multicellular irregularly spaced cilia or entire.....*S. roseus* var. *curvipes.*
d. Perianth rotate; leaf-margins with microscopic unicellular hyaline closely crowded teeth.....*S. streptopoides* var. *brevipes.*

Explanation of Plate

Fig. a, Streptopus roseus var. perspectus, rootstock × ½, from Garden River, Ontario, *Fassett*, no. 14655 (U. of Wis.). Fig. b, S. roseus var.

LONGIPES, rootstock × ½, from Blaney, Michigan, *Fassett*, no. 14663 (Gray). FIG. c, S. ROSEUS, rootstock intermediate between vars. PERSPECTUS and LONGIPES, × ½, from Nestorville, near Thessalon, Ontario, *Fassett*, no. 14660 (U. of Wis.). FIG. d, S. ROSEUS, rootstock showing characters of both var. PERSPECTUS and var. LONGIPES, × ½, from Pickford, Michigan, *Fassett*, no. 14658 (Gray). FIG. e, S. OBTUSATUS, flower, pedicel and peduncle, × 1½, from Szechuan, China, *Stevens*, no. 422; the black strip is 1 cm. wide. FIG. f, S. ROSEUS var. PERSPECTUS, flower, etc., × 1½, from Hanover, New Hampshire, *J. H. Fassett* (U. of Wis.); the black strip is 1 cm. wide. FIG. g, S. ROSEUS var. TYPICUS, flower, etc., × 1½, from White Top Mountain, Virginia, *Britton, Britton & Vail* (N. Y.); the black strip is 1 cm. wide. FIG. h, S. ROSEUS var. PERSPECTUS, flower, young fruit, etc., × 1½, from Labrador, *A. W. Hale* (N. Y.); the black strip is 1 cm. wide. FIG. i, S. ROSEUS var. TYPICUS, × 1½, from Roan Mountain, North Carolina, *John Donnell Smith* (U. S.); the black strip is 1 cm. wide. FIG. j, S. ROSEUS var. PERSPECTUS, inner surface of sepal, × 15, from Peacham, Vermont, *Blanchard* (Field). FIG. k, S. ROSEUS var. CURVIPES, inner surface of sepal, × 28, from Wellington, Washington, *Cameron & Lanocker* (Field). FIG. l, S. AMPLEXIFOLIUS var. CHALAZATUS, lower surface of leaf, × 7½, from Wallowa Lake, Oregon, *H. P. Hansen*, no. 1100 (U. of Wis.). FIG. m, S. AMPLEXIFOLIUS var. DENTICULATUS, lower surface and margin of leaf, × 7½, from Cascade Mountains, Washington, *J. M. Grant* (U. of Wis.); the white lines are 1 mm. apart. FIG. n, S. STREPTOPOIDES var. BREVIPES, leaf-margin, × 45, from Kelp Bay, Alaska, *Mr. & Mrs. E. P. Walker*, no. 804 (N. Y.). FIG. o, S. AMPLEXIFOLIUS var. AMERICANUS, leaf-margin, × 15, from Temiscouata County, Quebec, *J. F. Northrup*, no. 185 (N. Y.); the white lines are 1 mm. apart. FIG. p, S. AMPLEXIFOLIUS var. DENTICULATUS, leaf-margin, × 15, from Yakutat Bay, Alaska, *Funston*, no. 61 (N. Y.); the lines are 1 mm. apart. FIG. q, S. AMPLEXIFOLIUS var. OREOPOLUS, leaf-margin, × 15, from Tabletop Mountain, Quebec, *Fernald & Collins*, no. 197a (N. Y.); the lines are 1 mm. apart. FIG. r, S. AMPLEXIFOLIUS var. DENTICULATUS, leaf-margin, × 15, from Multnomah County, Oregon, *H. H. Smith*, no. 3093 (N. Y.); the lines are 1 mm. apart.

NOTES ON THE DESMID FLORA OF NEW ENGLAND II.

DESMIDS FROM CAPE COD AND THE ELIZABETH ISLANDS[1]

GERALD W. PRESCOTT

Plates 329 and 330

NEW England is one of the most favorable regions in the United States, if not in North America, for an abundant desmid flora. The highly glaciated topography provides numerous ponds, kettle-holes, and swamps which are, for the most part, made permanent by an adequate rainfall. The climatic conditions and the acidity of the water (pH 5.0–6.8), draining igneous rock in many sections, assist in producing a flora not only rich in species but in number of individuals as well.

The region is the collecting ground for America's earliest algologists and although it has long been a favorite haunt of the desmid student much still remains to be learned of the flora here. At the time of

[1] Printed with aid to RHODORA from the National Academy of Sciences.

writing the ecology of desmids in New England has scarcely been touched upon in the literature. There is also the problem of geographical distribution to be considered. When more taxonomic data are obtained some significant and interesting comparisons with other floras should be forthcoming. As yet it cannot be stated whether or not the region is characterized by a distinct type of flora or group of species. However, some properly qualified generalizations can be drawn.

Many early published reports on the desmids of New England are disappointing and of little use to the taxonomist because descriptions of species are incomplete and also because they are not accompanied by figures, or at best only by vague illustrations that leave altogether too much to the imagination. Again, several papers that do involve adequate figures have been published in foreign journals and are not readily accessible. The writer wishes to make a contribution by way of furnishing notes and illustrations for new species of desmids or forms new to the region, and also for those which have been inadequately or never figured for New England.

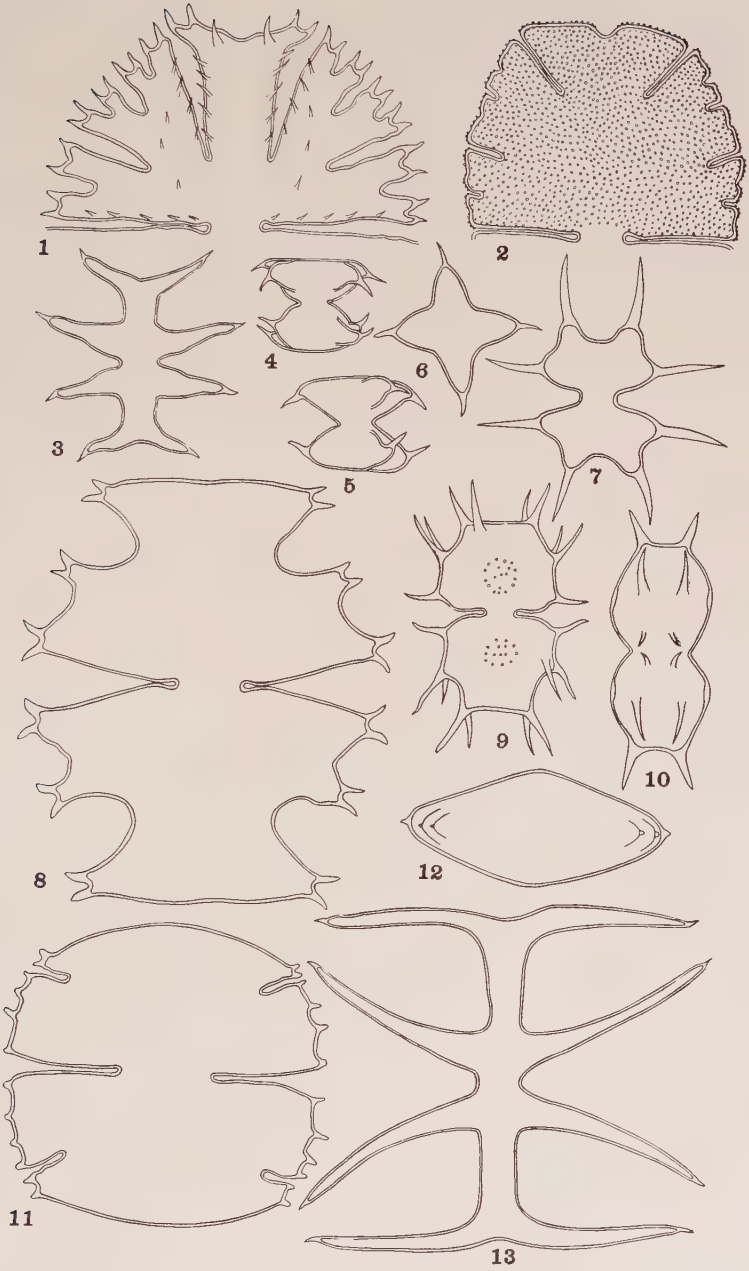
The forms mentioned below are from the author's collections made on Cape Cod and the Elizabeth Islands during the summers of 1932 and 1933 while stationed at the Marine Biological Laboratory. The type of habitat which contributed the greatest variety and number of individuals was the shallow pond with a sphagnum-bog margin. The ooze at the edge of such a pond or the squeezings from *Sphagnum* yielded a most amazing and delightful variety of species.

Plankton species on the other hand were found to be relatively scarce. It is noteworthy that, so far as studies have been made, the species of desmids in this area, and apparently throughout all of New England, make up a flora that is more comparable with that of Newfoundland and northern Europe than with that of Wisconsin and the central Canada region. This is particularly true for plankton species. It is to be expected of course that many forms are found which are of universal distribution. However, the appearance in New England of a large number of species found in Europe and England and not in west and mid-west North America indicates a significant distribution.

The author is grateful for the helpful suggestions of Dr. W. R. Taylor and also for the facilities provided by the Marine Biological Laboratory.

Xanthidium Ehrenberg, 1837.

Xanthidium cristatum de Breb. var. uncinatum de Breb. Smith, Wis. Geol. Nat. Hist. Surv. Bull. **57** (II): 60, Pl. 66, f. 4. 1924.



Desmids of New England

Forma. Width 32.0 μ without spines, 49.0 μ with spines; length 49.0 μ without spines, 67.4 μ with spines. Pl. 329, F. 9, 10.

The plant figured shows an unusual condition in which there is a pair of spines rather than one at the basal angles of the semicell. These show in the side view (F. 10). If this is a constant feature the variation should be given a form name but only the one specimen has been found.

Typical form previously reported from New England by Cushman in New Hampshire and from Maine by W. West. Pasque Island.

Arthrodesmus Ehrenberg, 1838.

Arthrodesmus impar (Jacobs.) Grönblad, Acta Soc. pro Fauna et Flora Fennica **49**, No. 7:55, Pl. 3, f. 58–60. 1921.—Width 26.4 μ without spines, 59.4 μ with spines; length 29.7 μ without spines, 66.0 μ with spines. Pl. 329, F. 7.

Except for Taylor's record (25) from Newfoundland this interesting plant has not been previously reported from North America. Pond near Falmouth, Cape Cod.

Staurastrum Meyen, 1829.

Staurastrum elongatum Barker. West and West, British Desmidiaceae V: 156, Pl. CLI, f. 2–5.—Semicell cyathiform with 3 rows of granules across the swollen base immediately above the isthmus. Width 48.0 μ; length 65.0 μ. Pl. 330, F. 8—Fla., Pa., Mich., Newfoundland (Taylor (26)). Pond near Falmouth, Cape Cod.

Staurastrum concinnum West and West, Jour. Linn. Soc. Bot. **33**: 317, Pl. 18, f. 17. 1897.—Semicells fusiform, gradually tapering into arms bearing three strong spines at their apices, dorsal margin of arm with three small spines; with a row of 6 bifurcate processes across the apex, below each one of which is a triangular-shaped verruca; ventral margin of semicell with 5–6 simple (sometimes bifurcate) spines on each arm; vertical view triangular, the angles extended into rather long arms that are tri-spinate, the margins furnished with a row of bifurcate processes, longer and much stouter midway between the apices of the arms; central region smooth. Width 57–66.0 μ including spines; length 34–45.0 μ including spines. Pl. 330, F. 3, 4.—Conn., N. H., Fla. Pond near Falmouth, Cape Cod.

This plant shows some variations in our collections, especially in vertical view, when they are compared with the figures of Hylander and the Wests. It should be compared with *St. vestitum* Ralfs and *St. ornithopodum* West and West, Trans. Linn. Soc. Bot. 5: Pl. 17, f. 18–20.

Staurastrum furcatum (Ehr.) de Breb. West and West, British Desmidiaceae V: 173, Pl. CLV, f. 1–4.—Width 30.0 μ; length 39.0 μ

including arms; isthmus 9–10.0 μ. Pl. 330, f. 12, 13.—Swamp near Chatham, Mass., Wis., Mich., Iowa, Newfoundland, Maine, Minn.

Staurastrum glabrum (Ehr.) Ralfs. West and West, British Desmidiaceae V: 2, Pl. CXXIX, f. 2–5; Trans. Linn. Soc. Bot. Ser. 2, **5**: 255, Pl. 16, f. 8.—Width 24.7 μ without spines, 34.2 μ with spines; length 26.6 μ; isthmus 9.3 μ. Pl. 329, f. 4–6.

Although a variety has been reported from North America by the Wests (l. c.) and the typical form in Michigan by Nichols and Ackley (18) this plant has not been figured in American literature apparently. I have found it in but one locality, a pond on Nonamessett Island. The specimens were all 4- rather than 3-angled.

Staurastrum striolatum (Naeg.) Archer. West and West, British Desmidiaceae IV: 177, Pl. CXXVII, f. 1–5.—Width 21.0 μ; length 20.0 μ; zygospore 39.0 μ in diameter, 23.0 μ thick, circular in one view with about 12 undulations at the margin, side view oblong. Pl. 330, f. 9, 10.—Swamp near Hyannis. Generally distributed.

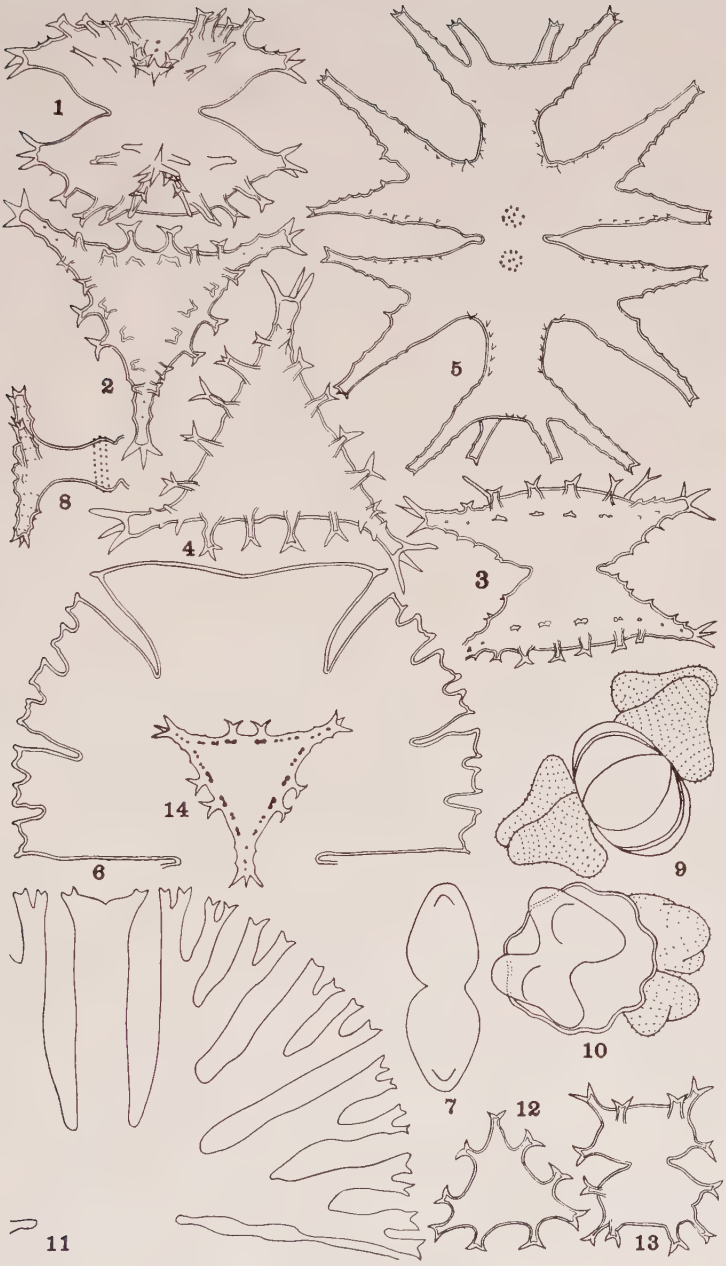
This characteristically shaped zygospore apparently has not been previously reported or figured for North America.

Staurastrum vestitum Ralfs. West and West, British Desmidiaceae V: 158, Pl. CLI, f. 9–11; Pl. CLII, f. 5–6.

Forma. Sinus open; semicells broadly subfusiform, apical margin slightly convex, showing eight bifurcate processes arranged (4 each) in two linear series extending from the apices of the lateral arms to the apex of the forwardly directed third arm of the semicell; below these two series two emarginate or simple processes on either side of the semicell; in vertical view triangular, the angles extended into tridenticulated processes, each margin furnished with 2 rather stout bifurcate processes, within each margin a series of 6 emarginate verrucae which may be elongated into processes. Width 46.2 μ; length 25–27.0 μ including processes. Pl. 330, f. 1, 2, 14.—Pond near Falmouth.

The chief difference between this form and the typical shows in vertical view, the marginal series of emarginate granules being replaced by coarse verrucae and bifurcated processes. The New England specimens bear out the remarks of Wests (l. c., p. 159) relative to the variability of this species. Very typical forms were found with the usual series of emarginate granules which were coarse and very prominent opposite the pair of marginal processes as seen in vertical view. Pl. 330, f. 14.

St. vestitum and its varieties have been found in many places in North America with New England records from Maine and Conn. The figure of Brown (3), Pl. 14, f. 93, certainly must be a form of var. *subanatinum* W. and G. S. West and not the typical.



DESMIDS OF NEW ENGLAND

MICRASTERIAS Agardh, 1827.

MICRASTERIAS ARCUATA Bailey, Smithsonian Contributions to Knowledge 2. 1851.

Var. GRACILIS West and West, Trans. Linn. Soc. London, Ser. 2, **5**: 238, Pl. 13, f. 27.—Width 70.0 μ; length 105.8 μ; isthmus 9–10.0 μ. Pl. 329, f. 13.—Swamps near Falmouth and Hyannis; Elizabeth Islands.

This elegant variety is distinguishable by its more slender arms and by a width that is 30–50 per cent greater than its length. Originally described from Pennsylvania it has also been reported by the Wests from Florida and from Alabama by Brown (3). From a consideration of Brown's figure, Pl. 12, f. 22, the author is convinced that the Alabama specimen is of the type and not the variety designated. The width of the plant shown is scarcely greater than the length and the general proportions throughout do not suggest var. *gracilis*.

MICRASTERIAS DECEMDENTATA Naegeli. Homfeld, Pflanzenforschung **12**: 34, Taf. 4, Fig. 40.

? Var. TURGIDUS Taylor (26). Width 91.2 μ; length 89.3 μ; isthmus 19.0 μ. PL. 329, F. 11, 12.—Pond near Falmouth.

Our specimens are almost identical with a form that Taylor (26) questionably designates as a new variety. The very much inflated semicells as seen in vertical view is the character that distinguishes it from the typical.

MICRASTERIAS DEPAUPERATA Nordstedt. West and West, Trans. Linn. Soc. London Ser. 2, **5**: 238, Pl. 14, f. 1.—Width 131.4 μ; length 142.8 μ; isthmus 24.5 μ; polar lobe 94.1 μ wide. PL. 329, F. 8.—Swamps, Cape Cod.

Previously reported from Massachusetts by Cushman (4) and Lagerheim (15), but not figured. It is to be noted that in our specimens the sinus is closed near the apex, a character not shown in any of the published figures thus far seen.

MICRASTERIAS EXPANSA Bailey, Smithsonian Contributions to Knowledge 2. 1851.

Forma. Lateral lobes nearly horizontal, dorsal margin straight, ventral margin distinctly tumid; arms of apical lobe diverging; lateral lobes and arms of apical lobe proportionately longer and more slender than in the type; apices of all angles rounded and aculeate. Width 49–53.2 μ; length 49–53.2 μ; isthmus 8–9.7 μ; width of polar lobe 32–34.0 μ.—Pond near Falmouth; swamps on Elizabeth Islands. PL. 329, F. 3.

M. expansa Bailey has been redescribed by Nordstedt as a variety of *M. arcuata* Bailey. However the expression known as *M. expansa* possesses some constant proportions of the semicell and other char-

acteristics which seem to qualify it as a distinct species. These are pointed out by Taylor (26).

In New England *M. expansa* has been previously reported by Cushman and Wolle and from Newfoundland by Taylor and Fogg (27). Distribution data for North America at present show this plant to be confined to the Atlantic coast region.

Micrasterias Jenneri Ralfs. West and West, British Desmidiaceae II: 86, Pl. XLII, f. 14; Pl. XLIII, f. 1, 2.—Width 107.5 μ; length 160.0 μ. Pl. 329, f. 2.—Swamp near Falmouth.

This plant has few records from the United States, known only in New England. It is described as rare in the British Isles. It apparently has never been figured for North America except by Wolle (37) and only incompletely.

Our specimens show a deeper and more decided apical notch than the form illustrated by Wests. From Wolle's figure our specimens differ in the depth of the lateral incisions and angles of divergence of the lateral lobes.

Micrasterias mahabuleshwarensis Hobson, Quart. Jour. Microsc. Sci. **1863**: 168.—Width 132.0 μ; length 148.0 μ; isthmus 19.0 μ. Pl. 330, f. 5.—Elizabeth Islands; swamp near Chatham. Conn., N. Y., Fla., Michigan (21).

This species is widely but apparently sparsely distributed along the Atlantic coast but published records seldom have included a figure. Wolle's figure is quite incomplete.

Micrasterias radiosa Ralfs. West and West, British Desmidiaceae II: 95, Pl. XLVI, f. 1, 2. 1905.

Var. ornata Nordstedt. Smith, Wisconsin Geol. Nat. Hist. Surv. Bull. **57**, (II): 47, Pl. 60, f. 3, 4. 1924.—Width 245.0 μ; length 247.0 μ; isthmus 26.0 μ. Pl. 330, f. 11.—Pond on Naushon Island.

Previously reported from Wisconsin and Iowa.

Micrasterias speciosa Wolle, Desmids of the United States, p. 119, Pl. XLV, f. 1, 2. 1884.

Forma. Width 110.5 μ; length 120.6 μ; width of polar lobe 45.2 μ; isthmus 15.0 μ. Pl. 329, f. 1.—Ponds near Hyannis, Woods Hole.

This plant, frequently met with in Cape Cod collections, shows a combination of characteristics which, to the writer, make its position difficult to determine. In many respects it is similar to Fa. of W. and G. S. West, Trans. Linn. Soc. London Ser. 2, 5: Pl. 14, f. 10, 11. In the depth of lateral and polar incisions and robustness of lobes of the semicell, as well as in the number of ultimate divisions, it is not unlike *M. conferta*. It has a marked resemblance to var. *novae-terrae* Cush.,

particularly as illustrated by Taylor (26), except that our plants have spines not shown in Taylor's figures. On account of the spines the Newfoundland plants are dissimilar to any variety of *M. conferta* known to the writer.

Wests' form of *M. speciosa* possesses spines along the margins of the apical lobe only, and the apical lobe is distinctly exserted. In our specimens this is not true of the apical lobe. Nevertheless, it seems well to consider the Cape Cod plant as an expression of *M. speciosa* rather than *M. conferta*. It appears to the writer that these two species of the genus require some study, at least in so far as they are interpreted by various authors.

Previously reported from New England by Hylander in Conn., and presumably by Wests.

Micrasterias triangularis Wolle, 1892. Width 169.0 μ; length 214.8 μ. Pl. 330, f. 6, 7.—Pond near Providence, R. I.; swamp near Hyannis. Pa., N. J., Newfoundland.

This rather rare form has not been reported for the United States since Wolle's record (1892). The apical lobe in our specimens does not agree with Wolle's figure, particularly in the amount of exsertion and I cannot be sure that the Massachusetts plant is not a variety. The plants I have seen agree with the figure and measurements as given by Taylor (26).

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Explanation of Plate 329

Fig. 1. Micrasterias speciosa Wolle. Fa. (× 492). Fig. 2. Micrasterias Jenneri Ralfs (× 295). Fig. 3. Micrasterias expansa Bailey (× 492). Figs. 4–6. Staurastrum glabrum (Ehr.) Ralfs (× 492). Fig. 7. Arthrodesmus impar (Jacobs.) Grönblad (× 492). Fig. 8. Micrasterias depauperata Nordst. (× 368). Fig. 9. Xanthidium cristatum var. uncinatum de Breb. (× 492). Fig. 10. Xanthidium cristatum var. uncinatum de Breb., side view of a semicell showing a pair of basal spines

(× 492). Fig. 11. Micrasterias decemdentata var. (?) turgidum Taylor (× 492). Fig. 12. Micrasterias decemdentata var. (?) turgidum Taylor, end view (× 368). Fig. 13. Micrasterias arcuata Bailey var. gracilis W. and G. S. West (× 492).

Explanation of Plate 330

Figs. 1, 2. Staurastrum vestitum Ralfs (× 860). Figs. 3, 4. Staurastrum concinnum W. and G. S. West, 4 (× 737); 3 (× 614). Fig. 5. Micrasterias mahabuleshwarensis Hobson (× 270). Figs. 6, 7. Micrasterias triangularis Wolle, 6 (× 270); 7 (× 127). Fig. 8. Staurastrum elongatum Barker (× 450). Figs. 9, 10. Staurastrum striolatum (Naeg.) Archer, zygospore (× 614). Fig. 11. Micrasterias radiosa var. ornata Nordst. (× 270). Figs. 12, 13. Staurastrum furcatum (Ehr.) de Breb. (× 614). Fig. 14. Staurastrum vestitum Ralfs (× 360).

OBSERVATIONS ON THE CYTOLOGY OF SEBACINA GLOBOSPORA N. SP.[1]

R. M. Whelden

Plate 331

In the course of an examination of a great many specimens of Tremellaceous fungi, the writer has found several of particular interest. One collection[2] was noticeable for several reasons, first because the young fruit bodies were found emerging from the ostioles of perithecia of a *Diaporthe* growing in small twigs of *Fraxinus sp.*, suggesting that the *Sebacina* might possibly be parasitic on the *Diaporthe;* second, because mounts in lacto-phenol-cotton blue solution showed extreme irregularity in the orientation of the septa of the basidia, raising the question of whether the nuclear phenomena here would be out of the ordinary; and finally, because it was impossible to identify the fungus as one already described. While the material obtained is a single collection and hence offers little opportunity to determine the range of variation, nevertheless the species appears within limits to be remarkably uniform and seems to justify the conclusion that it represents a new species.

The total collection, comprising some sixty separate fruit bodies, was received in a partially dried condition. A part of the material was at once placed in a moist chamber; after about six hours, part of the fruit bodies were removed and fixed, some in a chrom-acetic solution and some in a mercuric chloride-picric acid solution; eighteen hours later the rest of the material was removed from the moist cham-

[1] Contribution No. 137 from the Laboratories of Cryptogamic Botany of Harvard University.

[2] The fungus, collected at Louisville, Kentucky by Mr. Billy Lee, was sent by him to Dr. D. H. Linder, to whom my thanks are due for the pleasure of studying it.

ber and fixed in the same manner as the first, some thirty fruit bodies in all being thus fixed. This material was embedded, half of it in

Text-fig. Sebacina globospora, n. sp.

celloidin and half in paraffin, and stained in the manner which the writer has described elsewhere (1).

The young fructifications of this fungus appear as small hemispherical hyaline objects emerging from the ostioles of perithecia of *Diaporthe;* with age they spread out one square centimeter or more in a

somewhat irregular fashion over the surface of the bark, to which they are closely pressed. On drying the fruit bodies become distinctly chalky. The mycelium of young fruit bodies seems to originate in the hymenial layer of the perithecium of *Diaporthe* and to grow up through the ostiole, at the mouth of which the hyphae spread fan-wise (TEXT-FIG.). All hyphae comprising this portion of the fruit body, as well as those spreading over the bark in older bodies, are of binucleated segments of great length (FIG. 1). At the tip of each segment branching frequently occurs, especially after the hyphae have emerged from the ostiole. Near the distal, somewhat enlarged part of the segment, the two nuclei, from 2 to 2.5 μ in diameter, almost invariably lie close together, surrounded by a slightly denser region of cytoplasm. Near the surface of the fruit body the hyphal segments, still binucleate, become much shorter, twisted (FIG. 2), and frequently branched, while, in the subhymenial layer the segments are very short and straight (FIG. 3). The cross-walls of these short segmented hyphae frequently show a very evident central thickness which is accentuated by its staining black with haematoxylin. Fusions between two hyphae occur infrequently, but no clamp connections were observed.

At the surface of the fruit body there are cut off binucleate hyphal tips of which the protoplasmic content is much denser. These, the hypobasidial initials, rapidly increase in size, while at the same time the dikaryons unite to form the fusion nucleus, which quickly enlarges to its maximum size of 5 to 6 μ. During this enlargement the chromatin substance becomes more and more definitely aggregated into somewhat irregular elongate masses, which, as the nucleus approaches its maximum size, contract rapidly to form eight distinct small chromosomes (FIGS. 8–10, 13). These chromosomes are short cylindrical objects which seem to show certain distinct differences in size, differences which may be somewhat exaggerated because of the orientation of the chromosomes. At this time the conspicuous nucleolus begins to disappear, as does also the nuclear membrane, leaving the chromosomes centrally located in the protoplasm of the now fully enlarged hypobasidium, with an average measurement of 17.2 x 14.2 μ. Throughout the development of the hypobasidium there has been little change in the appearance of its cytoplasm, which has become somewhat thinner and progressively more vacuolate, especially after nuclear division has occurred. Frequently there are seen scattered through it small granules which stain deeply with haematoxylin (FIGS. 7, 8).

Nuclear division immediately results in the formation of two small daughter nuclei, which may occupy any position in the hypobasidium, although usually they are midway in it (figs. 12, 33). One or both of these nuclei may immediately divide again so that one often sees hypobasidia, in which the three or four nuclei are arranged without order (figs. 19, 20).

The formation of the first longitudinal septum may occur immediately after the first division of the fusion nucleus (figs. 14, 18), or it may be delayed until a much later stage of development; the time of appearance of the second longitudinal septum is equally variable. The direction of these septa of the hypobasidia differs greatly, ranging from the usual longitudinal ones to diagonal ones at every conceivable angle, with frequent cases in which they are oriented at right angles to the long axis of the hypobasidium (figs. 21, 25). Not infrequently the first septum divides the hypobasidium transversely in two equal parts, while the second septum cuts one of these sections longitudinally in two, the other remaining without septation (fig. 26).

The development of the epibasidia likewise shows the greatest irregularity. In the species of *Sebacina* previously studied by the writer, the two to four epibasidia normally developed simultaneously from the apical portion of the hypobasidium. In the present species one often sees hypobasidia showing this characteristic development, the two, rarely more, epibasidia growing directly upward to the surface of the "jelly," expanding slightly or not at all (fig. 17). However, much more frequently the epibasidia develop very irregularly. The variation from the normal condition may be one of direction only, the two epibasidia growing out at wide angles one to the other, a condition particularly noticeable near the edge of the fruit body (fig. 5, left). Much more frequent are irregularities in time of appearance of the epibasidia; for example the epibasidium of one of the segments of the hypobasidium may develop only slightly in advance of the other, as in fig. 22, or may complete its development to spore formation while the other segment shows no indication of such, as in fig. 15; as a result of such irregularities one frequently observes hypobasidia with one half empty (fig. 27) and partially (fig. 23) or completely collapsed (fig. 34). Even more striking are the hypobasidia in which septum formation is transverse rather than longitudinal; in these either the upper (fig. 25) or the lower half (fig. 21) may have discharged its contents in spore formation, while the other half remains unchanged. Frequently the empty portion shows that it was divided independently of the other as in fig. 26.

That nuclear divisions occur independently of these changes may be seen in such cases as those shown in fig. 25, where the nucleus in the lower portion of the hypobasidium is in the early prophase of division, or more obviously in FIG. 35, where the four chromosomes are definitely present just before the disappearance of the nucleolus and nuclear membrane in metaphase. Nor does any correlation seem to exist between the nuclear condition and the epibasidia, as for example in FIG. 21, where two small epibasidial bulges appear before the single nucleus present in the segment of the hypobasidium shows any sign of division. As the development of the epibasidium progresses, the protoplasm of the hypobasidium becomes more and more vacuolate. The epibasidia themselves vary from the slender form with a uniform diameter from 1 to 1.3 μ of FIG. 33 to a very much swollen type (FIG. 15) in which the maximum diameter is 5 μ. All epibasidia contract rather abruptly at the "jelly" surface to form the slender sterigma at the tip of which the spore is formed.

The spores enlarge rapidly and when mature are subspherical to spherical bodies usually about 8 μ in diameter; rare individuals occur having dimensions of 7.8 x 7 μ to a maximum of 9 x 8 μ: all have a pronounced apiculus 1 μ or slightly more in length (FIG. 28). They often germinate immediately by a single germ tube (FIGS. 29–32), which attains a length of 6–8 μ before forming the secondary spore, similar to, but smaller than, the primary basidiospore. The same variations in form obtain in these germ tubes as occurred in the epibasidia, some being slender and slightly twisting (FIG. 10), others very coarse and straight, (FIG. 32), while still others are considerably inflated and 4 to 4.5 μ in diameter in the middle (FIGS. 31, 32). Germination of the secondary spores was not observed.

From the distal end of the hyphal segment immediately below the hypobasidium one or more branches form soon after the hypobasidium is cut off (FIGS. 7, 12). Two nuclei soon move into the developing branch after which it is cut off by a cross-wall, and becomes another hypobasidium (FIGS. 4, 16). In rare cases the lateral branch appears from the beginning to be somewhat vacuolate; in living bodies these branches are seen to contain many large drops of a refractive substance which, however, in the process of embedding and staining is dissolved out, so that they appear vacuolate (FIGS. 10, 24). These gloeocystidia, as the vacuolate structures may be classified, are always binucleate, although frequently the position of the nuclei, close together one above the other, gives the appearance of a uninucleate con-

dition. What may eventually become of these objects as growth of the fruit body continues was not observed. Other branches start as do these, but grow to a considerable length (figs. 11, 23) without noticeable change in diameter or in content: these are probably merely vegetative hyphae characteristic of rapidly growing fruit bodies.

The writer, having already discussed at considerable length the work which has been done on the Tremellaceous fungi (1), does not feel that any long discussion is necessary here. It is to be noted, however, that several workers have reported the occurrence of irregular septation in the basidia of this group, some of them finding therein points indicating the origin of the group; yet so far as the writer knows, there has been no study of the cytological condition involved. With material of this sort available, it seemed of value to ascertain whether any irregularity in nuclear behavior accompanied the more obvious irregularities of septation. The present study indicates that up to the time of septation in the hypobasidium, development is practically identical with that observed in all other members of the group which have been studied. However, both the time and direction of septum formation, as well as the subsequent development of the epibasidia show great irregularity. There at once appear three possible explanations for these irregularities: first is the fact that the fungus before study was revived in a moist chamber; however, the writer has used that method many times in studying other species of *Sebacina*, and only rarely found any irregular forms. Again it may be suggested that the growth of the fruit bodies apparently parasitic on an Ascomycete is significant; while this might account for the variations from normal, there seems to be no real reason why it should. Finally it would seem to the writer more probable that the cause for the irregularities is inherent in the fungus itself. Certainly all the fruit bodies studied in this collection agree in showing the variations, indicating that it is apparently characteristic of the species. Because of this and of the more important fact that the dimensions of its parts, notably the hypobasidia and spores, are considerably larger than those of the species it most closely resembles, *Sebacina* (*Bourdotia*) *cinerella* Bourd. et Galz., the writer feels justified in proposing it as a new species of *Sebacina:*

Sebacina **globospora**, sp. nov., fruit bodies at first hemispherical and colorless, becoming watery-gray effuse bodies from 6 to 12 mm. in extent, on drying becoming chalky, pressed against but not adnate to the substratum. Hyphae 2 to 3 μ in diameter, without clamp connections. Basidia ovate, 15–17–20 x 12–14–16 μ; average: 17.2 x 14.2 μ.

Epibasidia variable, up to 14 μ in length, 2–3–(5) μ in diameter. Spores spherical to subspherical, 7.8 to 8 μ in diameter, each with a pronounced apiculus. Gloeocystidia rare, 28–35 x 7 μ when mature. Young fruit bodies growing from the ostioles of the perithecia of *Diaporthe*, older ones spreading out over the surface of bark of twigs of *Fraxinus;* collected near Louisville, Kentucky, in September, 1934. (Type in Farlow Herbarium, Harvard University.)

Sebacina **globospora** sp. nov. Fructificationes primo subglobosae decoloresque, tardius cinereae, hyalinae, effusae, 6–12 mm. extensis, exsiccatae cretaceae, depressae sed non substrato adnatae. Hyphae 2–3 μ diam., anodosae. Basidia ovata, 15–17–20 x 12–14–16 μ (plusminusve 17.2 x 14.2 μ). Epibasidia inconstantia, ad 14 μ longa, 2–3–(5) μ diam. Sporae globosae vel subglobosae, hyalinae, leves, 7.8–8 μ diam., evidenter apiculatae. Gloeocystidia rara, clavata, 28–35 x 7 μ.

Summary

Sebacina globospora, sp. nov., growing from the ostioles of and apparently parasitizing the perithecia of *Diaporthe*, is of particular interest because of the irregularities in the formation of the septa of the hypobasidia, and the time of development of epibasidia. The septa are formed in almost every conceivable position in the hypobasidium. Variation in epibasidial development ranges from the simultaneous formation of the two to four epibasidia to those cases in which one epibasidium has borne a mature spore before the others have appeared at all. The tendency towards suppression of branching as shown in Figs. 5 and 16 immediately calls to mind the condition existing in *Sirobasidium*, in which genus the branching habit has been totally suppressed, to be replaced by a basipetal formation of basidia.

Explanation of Plate 331

All figures drawn with the aid of a Camera lucida at a magnification of about 3700 ×, and reduced in reproduction to about 0.3 ×. An absolute scale is included in the plate.

Figure 1. Elongate mycelial segment in older portions of fruit body. 2. Mycelial segment near surface of fruit body. 3. In sub-hymenial region. 4. Binucleate hypobasidial initial (right) and young hypobasidium (left). 5. Widely diverging epibasidia from a hypobasidium near margin of fruit body, also showing suppression of branching. 6. Hypobasidium with fusion nucleus showing linear masses of chromatin. 7. Basidia developed from single branch tip near center of fruit body. 8. Contraction of chromatin masses. 9 & 10. Eight chromosomes and nucleolus within the nuclear membrane; lateral branch in figure 10 showing early appearance of gloeocystidium. 11 & 12. Hypobasidium containing four and two small nuclei respectively. 13. Hypobasidium containing eight chromosomes and nucleolus in late prophase of fusion nucleus. 14. First longitudinal septum forming after first division of nucleus. 15. A basidium with one epibasidium completely developed, the other not as yet in evidence. 16. Two well-developed hypobasidia at tip of hypha. 17. Normal development of two epibasidia from hypobasidium. 18. Formation of first longitudinal septum diagonally. 19. Early appearance of epibasidia

before septa are formed. 20. Four-nucleate epibasidia. 21 to 23; 25 to 27, 33 to 35. Abnormal septations of hypobasidia. In figure 33 no septa have been formed, while in figure 35 nucleus of lower cell is in prophase condition. 24. Immature gloeocystidium with much vacuolate protoplasmic content. 28. Uninucleate spores. 29 to 32. Germinating spores, showing variations of germ tube.

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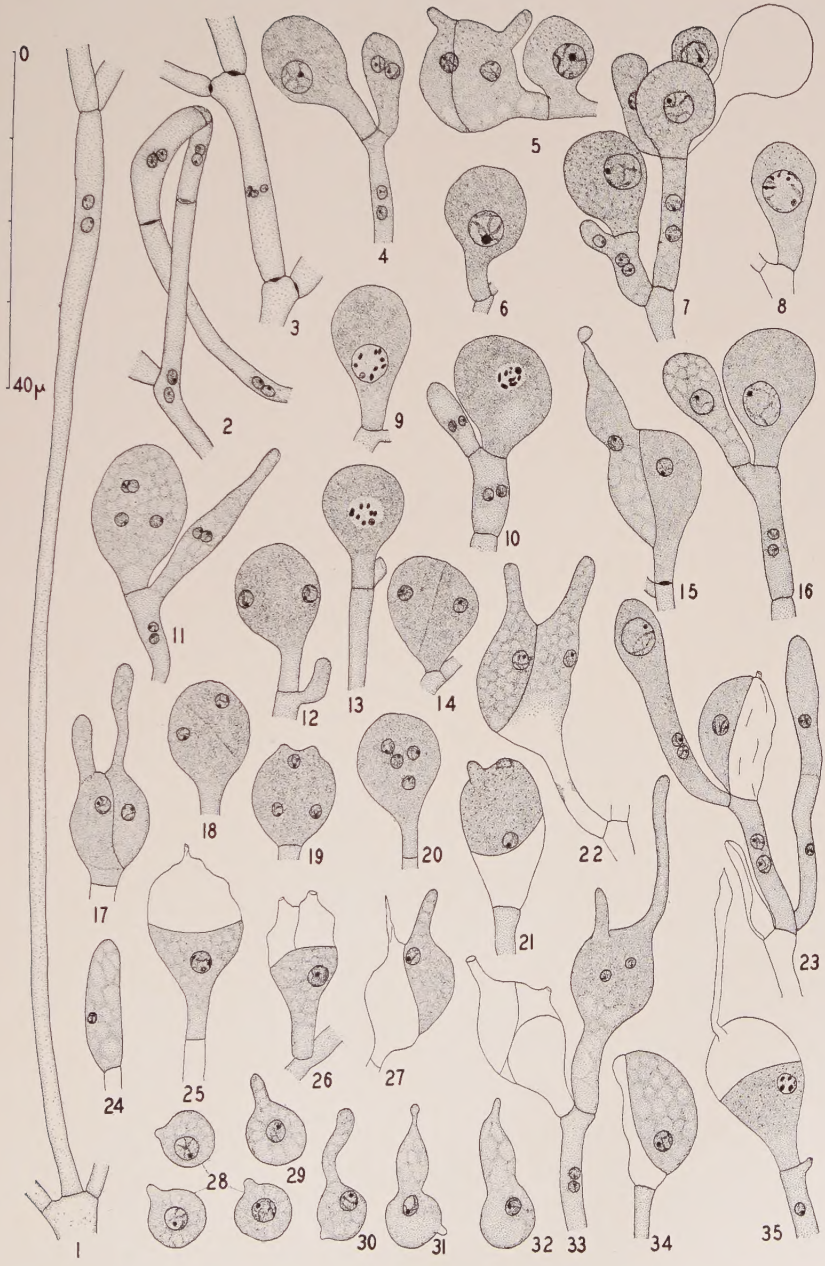
A New Carex Hybrid.—Sometime during the winter of 1932–33, I received an exchange packet of plants from Professor Alfred S. Goodale of Amherst College. One of these was no. 68660, labelled *Carex pallescens*, from Woodstock, Grafton County, New Hamphsire, collected June 21, 1932. It did not look "right" to me, so I laid it aside for further study at the Gray Herabrium, after concluding it was a hybrid. Upon showing it to Professor Fernald, he suggested that it might be *C. hirtifolia* × *pallescens*. Critical study would seem to show that this "educated guess" was entirely correct. The leaves are as long, as broad, and as softly pubescent as in luxuriant *C. hirtifolia*. In technical characters the perigynia are exactly as in *C. pallescens*, but the scales tend to be more truncate, as in *C. hirtifolia*. The pistillate spike as a whole is, however, a combination of the two species, as it is larger and more long-cylindric than in *C. pallescens*. The staminate spike is well developed and 2 cm. long, much as in *C. hirtifolia*. At the same time Professor Goodale sent another sheet to the New England Botanical Club. Both presumed parent species occur in the Woodstock region. The hybrid origin of the collection seems to be the best interpretation of the facts at the moment. Certainly no sheet of *C. pallescens* in the enormous series in the Gray and the New England Club herbaria shows any such extreme of variation. —Ludlow Griscom, Harvard University.

Volume 37, no. 434, including pages 33–76 and plate 326, was issued 8 January, 1935.



Sebacina globospora, n. sp.

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